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Development Document for Proposed Effluent Limitations Guidelines, New Source Performance Standards, and Pretreatment Standards for the Iron and Steel Manufacturing Point Source

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and

PRETREATMENT STANDARDS

for the

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COLD FORMING SUBCATEGORY

COLD ROLLING

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HOT COATING SUBCATEGORY

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COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION I

PREFACE

The USEPA is proposing effluent limitations and standards for the steel industry. The proposed regulation contains effluent limitations for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS), under Sections 301, 304, 306, 307, and 501 of the Clean Water Act.

This part of the Development Document highlights the technical aspects of EPA's study of the Cold Rolling Subdivision of the Cold Forming Subcategory of the Iron and Steel Industry. Volume I of the Development Document discusses issues pertaining to the industry in general, while other volumes relate to the remaining subcategories of the industry.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION II

CONCLUSIONS

This report highlights the technical aspects of EPA's study of the cold rolling subdivision of the cold forming subcategory. Based upon this current study and a review of previous studies, the Agency has reached the following conclusions.

1. Cold rolling and cold worked pipe and tube operations are combined into one subcategory called "Cold Forming." Because of differences in mill operation and effluent disposal practices, the two operations are reviewed separately.

2. The Agency is retaining the previous segmentation for cold rolling operations. Proposed limitations and standards have been developed separately for recirculation, combination, and direct application mills because of differences in flow rates and wastewater characteristics.

3. The Agency is proposing BPT limitations for the cold rolling subdivision which are identical to those previously promulgated in 1976. Data obtained from the industry since the original study demonstrates that the proposed limitations are achievable, and in fact, less stringent than might be justified.

4. Reanalysis of the cold rolling data base has shown that the BPT model treatment system flows for combination and direct application mills (400 gal/ton and 1000 gal/ton, respectively) are less stringent than might be justified. Nonetheless, they have been retained as the model flows for the proposed BPT limitations. The Agency believes that a BPT model discharge flow of 250 gal/ton for combination operations and 400 gal/ton for direct application operations might be appropriate. These values are used as the model flows for the proposed BAT limitations. The Agency solicits comments on whether more stringent BPT limitations based upon these lower flows are appropriate.

5. Sampling and analysis of recirculation type cold rolling operations demonstrated that toxic organic pollutants at levels in excess of 5 mg/l are present in their wastewaters. The Agency concludes that toxic pollutant removal should be incorporated in the various alternative treatment system for recirculation and combination cold rolling operations.

6. Sampling and analysis of direct application cold rolling mills did not reveal the presence of significant levels of toxic organic pollutants. For this reason, the Agency is not proposing limitations for toxic organic pollutants for operations that use

direct application oil systems on all rolling stands. Wastewaters from these mills, however, contain significant levels of toxic metal pollutants, so control measures for these pollutants are incorporated in the alternative treatment systems as was done for recirculation and combination mills.

7. EPA estimates that compliance with the proposed BPT and BAT limitations will result in significant removals of toxic, conventional and other pollutants. A summary of the discharges at the proposed BPT and BAT levels of treatment are shown below.

	Effluent Loadings (Tons/Year)		
	Raw Waste	Proposed BPT	Proposed BAT
Flow, MGD	39.4	39.4	39.4
TSS	16,290	3,130	860
Oil and Grease	112,500	1,250	285
Toxic Metals	185	38	34
Toxic Organics	280	265	33

8. EPA estimates that the industry will incur the following costs in complying with the proposed limitations for cold rolling operations.

	Costs (Millions of July 1, 1978 Dollars)			
	Investment Costs			Total
	Total	In-Place	Required	Annual
BPT	52.3	22.0	30.3	9.7
BAT	24.0	0	24.0	4.5
TOTAL	76.3	22.0	54.3	14.2

NOTE: PSES costs are included in the BPT and BAT costs and BCT costs are included in the BAT costs.

9. The presence of toxic organic pollutants in cold rolling wastewaters was found to be highly variable. The Agency believes this variability is attributable to the oil solutions used at the operations. This conclusion is based upon sampling results gathered at several mills which have shown site-specific organic contamination. Some mills do not exhibit any problems with organic contaminants while several discharge toxic organics in the 10 ppm range.

The Agency is proposing limitations and standards for certain toxic organic pollutants at recirculation and combination operations. The Agency believes these limitations can be achieved by the installation of demonstrated treatment technology, or by substituting oil solutions. The Agency solicits more data and information on this issue.

10. Although the Agency identified a significant number of the toxic metal pollutants in the raw and treated wastewaters from cold rolling operations, it believes that it is not necessary to

propose limitations for every toxic metal detected. Adequate limitation of the toxic metals can be attained by controlling the three toxic metals currently proposed for limitation.

11. The Agency evaulated the "cost/reasonableness" of controlling conventional pollutants and concludes that the control based upon the proposed BCT model treatment systems are less than the costs experienced by publicly owned treatment works for combination and direct application operations. Therefore, it is proposing BCT limitations for these mills based upon the application of the BCT model treatment systems. The BCT alternative treatment system for recirculation operations did not pass the BCT cost test. Accordingly, the Agency is proposing BCT limitations for recirculation mills which are the same as the proposed BPT limitations.

12. The Agency concluded that all new source cold rolling operations can be of the recirculation type. The Agency considered two NSPS alternative treatment systems for these operations. The NSPS proposed standards and treatment systems are similar to those of BAT alternative treatment systems 1 and 2. Based upon demonstrated flows, a lower discharge flow rate is included in the NSPS model treatment system.

13. The Agency is proposing pretreatment standards for new and existing sources (PSNS and PSES) discharging to POTWs. Those standards limit the discharges of toxic metal and organic pollutants as well as oil and grease to insure that the emulsified oils present will be sufficiently treated prior to discharge to POTWs. These standards are intended to minimize the impact from cold rolling wastewater pollutants which would interfere with, pass through or otherwise be incompatible with POTW operations.

14. With regard to the "remand issues," the Agency has concluded that:

    a. Neither relaxed effluent limitations nor retrofit cost allowances are appropriate for older cold rolling operations. The age of a cold rolling mill has no significant effect upon the ease or cost of retrofitting pollution control equipment.

    b. The alternative treatment systems considered for cold rolling operations do not include cooling or recycle systems. Hence, there are no consumptive water use impacts.

15. Table II-1 presents the treatment model flow and effluent quality data used to develop the proposed BPT effluent limitations for cold rolling, and Table II-2 presents these proposed limitations. Table II-3 presents the treatment model flow and effluent quality data used to develop the proposed BAT and BCT effluent limitations and the proposed NSPS, PSES, and PSNS for cold rolling; Table II-4 presents these proposed limitations and standards.

TABLE II-1

BPT TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
COLD FORMING SUBCATEGORY - COLD ROLLING

Pollutant	Monthly Average Concentrations(1) Recirculation	 Combination	 Direct Application
Flow, gal/ton	25	400	1000
TSS	25	25	25
O&G	10	10	10
Iron, Dissolved(2)	1.0	1.0	1.0
pH, Units	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0

---

(1) Daily maximum concentrations are three times the monthly average concentrations. All concentrations are expressed as mg/l unless otherwise noted.

(2) Dissolved iron is limited only when cold rolling wastewaters are treated with pickling wastewaters.

TABLE II-2

PROPOSED BPT EFFLUENT LIMITATIONS
COLD FORMING SUBCATEGORY - COLD ROLLING

	Effluent Limitations (kg/kkg of product)(1)		
Pollutant	Recirculation	Combination	Direct Application
TSS	0.00261	0.0417	0.104
O&G	0.00104	0.0167	0.0417
Iron, Dissolved(2)	0.000104	0.00167	0.00417
pH, Units	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0

---

(1) Daily maximum effluent limitations are three times the monthly average limitations.

(2) Dissolved iron is limited only when cold rolling wastewaters are treated with pickling wastewaters.

TABLE II-3

TREATMENT MODEL FLOWS AND EFFLUENT QUALITY COLD FORMING SUBCATEGORY - COLD ROLLING

		Monthly Average Concentrations (1)				
	Pollutant	BAT	BCT	NSPS	PSES	PSNS
A.	Recirculation					
	Flow, gal/ton	25	25	10	25	10
	TSS	-	25	15	-	-
	O&G	-	10	10*	-	-
119	Chromium, Total	0.1	-	0.1	0.1	0.1
122	Lead	0.1	-	0.1	0.1	0.1
128	Zinc, Total	0.1	-	0.1	0.1	0.1
011	1,1,1-Trichloroethane	0.1	-	0.1	0.1	0.1
057	2-Nitrophenol	0.025	-	0.025	0.025	0.025
078	Anthracene	0.01	-	0.01	0.01	0.01
085	Tetrachloroethylene	0.05	-	0.05	0.05	0.05
	pH, Units	-	6-9	6-9	-	-
B.	Combination					
	Flow, gal/ton	250	250	(2)	250	(2)
	TSS	-	15		-	
	O&G	-	10*		-	
119	Chromium, Total	0.1	-		0.1	
122	Lead	0.1	-		0.1	
128	Zinc, Total	0.1	-		0.1	
011	1,1,1-Trichloroethane	0.1	-		0.1	
057	2-Nitrophenol	0.025	-		0.025	
078	Anthracene	0.01	-		0.01	
085	Tetrachloroethylene	0.05	-		0.05	
	pH, Units	-	6-9		-	

TABLE II-3
TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
COLD FORMING SUBCATEGORY - COLD ROLLING
PAGE 2

	Pollutant	Monthly Average Concentrations (1)				
		BAT	BCT	NSPS	PSES	PSNS
C.	Direct Application					
	Flow, gal/ton	400	400	(2)	400	(2)
	TSS	-	15		-	
	O&G	-	10*		-	
119	Chromium, Total	0.1	-		0.1	
122	Lead	0.1	-		0.1	
128	Zinc, Total	0.1	-		0.1	
	pH, Units	-	6-9		-	

---

(1) Daily maximum concentrations are based upon the monthly average concentrations multiplied by the following factors:

Pollutants	Factor
TSS (BCT for recirculation)	3.00
TSS (all others)	2.67
O&G (BCT for recirculation)	3.00
O&G (All other)	*
Chromium, Lead, Zinc	3.00
1,1,1-Trichloroethane, 2-Nitrophenol, Anthracene, Tetrachloroethylene	3.00

Also, all concentrations are expressed as mg/l unless otherwise noted.

(2) No NSPS or PSNS are being proposed for combination and direct application mills. All new source plants shall incorporate recirculation systems.

* Daily maximum concentrations only, as shown.

TABLE II-4

PROPOSED EFFLUENT LIMITATIONS AND STANDARDS
COLD FORMING SUBCATEGORY - COLD ROLLING

		Effluent Limitations and Standards (kg/kkg of Product)(1)				
	Pollutant	BAT	BCT	NSPS	PSES	PSNS
A.	Recirculation					
	TSS	-	261	62.6	-	-
	O&G	-	104	41.7	-	-
119	Chromium, Total	1.04	-	0.417	1.04	0.417
122	Lead	1.04	-	0.417	1.04	0.417
128	Zinc, Total	1.04	-	0.417	1.04	0.417
011	1,1,1-Trichloroethane	1.04	-	0.417	1.04	0.417
057	2-Nitrophenol	0.261	-	0.104	0.261	0.104
078	Anthracene	0.104	-	0.0417	0.104	0.0417
085	Tetrachloroethylene	0.521	-	0.209	0.521	0.209
	pH, Units	-	6-9	6-9	-	-
B.	Combination					
	TSS	-	1560	(2)	-	(2)
	O&G	-	1040*		-	
119	Chromium, Total	10.4	-		10.4	
122	Lead	10.4	-		10.4	
128	Zinc, Total	10.4	-		10.4	
011	1,1,1-Trichloroethane	10.4	-		10.4	
057	2-Nitrophenol	2.61			2.61	
078	Anthracene	1.04	-		1.04	
085	Tetrachloroethylene	5.21	-		5.21	
	pH, Units	-	6-9		-	

TABLE II-4
PROPOSED EFFLUENT LIMITATIONS AND STANDARDS
COLD FORMING SUBCATEGORY - COLD ROLLING
PAGE 2

	Pollutant	Effluent Limitations and Standards (kg/kkg of Product) (1) BAT	BCT	NSPS	PSES	PSNS
C.	Direct Application					
	TSS	-	2502	(2)	-	(2)
	O&G	-	1670*		-	
119	Chromium, Total	16.7	-		16.7	
122	Lead	16.7	-		16.7	
128	Zinc, Total	16.7	-		16.7	
	pH, Units	-	6-9		-	

---

(1) The proposed limitations and standards have been multiplied by 10^5 to obtain the values presented in this table. Also, daily maximum limitations and standards are based upon the monthly average values multiplied by the following factors:

Pollutant	Factor
TSS (BCT for recirculation)	3.00
TSS (all others)	2.67
O&G (BCT for recirculation)	3.00
O&G (All other)	*
Chromium, Lead, Zinc	3.00
1,1,1-Trichloroethane, 2-Nitrophenol, Anthracene, Tetrachloroethylene	3.00

(2) No NSPS or PSNS are being proposed for combination and direct application mills. All new source plants shall incorporate recirculation systems.

* Daily maximum limitation only, as shown.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION III

INTRODUCTION

General Discussion

Cold rolling is the process in which flat steel products are reduced in thickness by rolling operations without preheating the product. The rolling operation works the steel to provide added strength, better surface quality and other mechanical properties. Oil solutions are applied directly to the rollng stands to dissipate the increase in temperature of both the work rolls and the product as it is mechanically processed, and to provide lubrication. Various oils and oil application systems are used depending on the product being rolled and the properties in the steel desired. There are primarily three types of oil application systems used today: (1) Recirculation; (2) Combination; and (3) Direct Application. The cold rolling subdivision has been segmented to recognize differences in these systems.

Due mainly to the use of the oil solutions, various pollutants are discharged in high levels from the cold rolling mills. The two most common are oil and grease and total suspended solids. However, due to the nature of some of the oils used in the process, toxic metals and toxic organic pollutants are also present in cold rolling wastewaters. The configuration of the mills and the pollutants generated is discussed in greater detail in later sections.

The Agency promulgated BPT limitations for cold rolling (CR) operations in 1976, and covered four pollutants: oil and grease, total suspended solids, dissolved iron, and pH. For this study, the Agency conducted additional sampling and gathered detailed information from the steel industry to obtain an expanded data base.

Data Collection Activities

Valuable process information and wastewater quality data were obtained through sampling visits at 52 cold rolling operations at 17 plant locations. The Agency conducted eleven sampling visits during the original guidelines study and visited seven plants during the recent toxic pollutant survey (one plant was resampled). The plants which were sampled during the course of this study are listed in Table III-1.

The Agency's primary source of new information is industry responses to the DCPs that were sent to approximately 85% of the active cold rolling operations in the United States. These questionnaires requested information on process and discharge flow rates, treatment systems in use, mill capacities and modes of operation. DCP responses were received for two hundred and twenty nine cold rolling mills. The data for these mills have been tabulated and are summarized in Tables III-2 to III-5. Table III-2 lists all the plants that have cold rolling mills and describes the number and type of the cold rolling mills at each site. Tables III-3 to III-5 provide more detailed information for individual mills. These tables have been separated by the type of oil application system because the mills are segmented on this basis and also so that mills of similar configuration can be more easily compared.

Detailed Data Collection Portfolios (D-DCPs) were sent to selected mills to gather long-term effluent quality data, cost data for treatment systems installed, and information on mill operations. The Agency sent D-DCPs to thirty-one CR mills. The D-DCP responses provided data to verify Agency cost estimates, establish retrofit costs, and to provide additional effluent quality data. Tables III-6 through III-8 summarize the data base for cold rolling operations.

Cold Rolling Limitations

In the originally promulgated regulation, the limitations for cold rolling operations were established separately by mill type (oil application system), and pertained to each mill as a whole regardless of the number of rolling stands present at the mill. The Agency reexamined this segmentation to determine if this was the most appropriate way to develop cold rolling limitations.

First examined was whether three sets of limitations for the different oil application systems was appropriate. The Agency analyzed available data for all mills and contacted the mill operators and designers. From this study, the Agency determined that not all cold rolling mills can make the modification from either direct application or combination systems to recirculation systems. Some direct application and combination type mills can recirculate all oil solutions, but some mills have oil sumps located beneath the mills. To convert these mills to recirculation systems would require major capital investments and production disruptions. For this reason, the Agency is again proposing BPT, BCT, BAT, and PSES limitations and standards by mill type. However, the proposed NSPS are based upon recirculation oil application systems since recirculation systems can be incorporated into all new mills.

Another issue investigated during this study was the possibility of proposing limitations on a "per stand" basis as opposed to a "per mill" basis, to account for possible flow variations that can occur between cold rolling mills with unequal numbers of stands. This would involve developing allowable loads for one stand so if a mill had five stands the allowable load for that mill would be five times the basic allowance.

The Agency tabulated all available data and compared both methods (limitations on a per mill basis vs. limitations on a per stand basis). In neither case, were the limitations significantly different than those proposed herein using the segmentation of cold rolling operations by oil application system. Therefore, the Agency is proposing limitations on the same basis as was done in the original regulation.

Description of Cold Rolling Operations

Cold rolling is that operation where unheated metal is passed through a pair of rolls to reduce its thickness, to produce a smooth dense surface, and to develop controlled mechanical properties of the metal.

There are various types of cold rolling processes. Cold reduction is a special form of cold rolling in which the thickness of the product is reduced by relatively large amounts in each pass through the rolls. In the production of most cold rolled materials, the cold reduction process is used to reduce the thickness of the hot rolled breakdown between 25% and 90%. After cleaning and annealing, a considerable amount of product is tempered. In tempering, the thickness of the material is reduced only a few percent to impart desired mechanical properties and surface characteristics.

Cold rolled strip, cold rolled sheet, and cold rolled flat bar are the principal cold reduced flat products. Carbon, alloy or stainless steels are used depending on the end use of the products. Most products rolled are carbon steel in sheet form and are used as base material for such coated products as long terne sheets, galvanized sheets, aluminum coated sheets, tin- plate, or tin-free steel. Hot rolled coils called "breakdowns" are the base material used in the cold rolling operation. Prior to rolling, however, they must be descaled and pickled, usually in a continuous pickling operation.

There are several types of cold reduction mills which vary in design from single stand reversing mills to continuous mills with up to six stands in tandem (in series). In the single stand reversing mill, the product is rolled back and forth between the work rolls until the desired thickness and mechanical and surface characteristics are achieved. In the single stand nonreversing mill the material makes a single pass through the rolls and is recoiled. If additional rolling is required the coil is returned to the head of the mill and reworked. The single stand nonreversing mill is generally used for tempering operations.

Most cold reduced flat steel is rolled on continuous three, four, or five stand tandem mills. In these mills the material continually passes from roll to roll until the desired thickness is attained. The continuous rolling mills represent modern technology and is the type of equipment installed in new mills.

A typical modern cold rolling shop contains a continuous pickling operation (sulfuric or hydrochloric acid) to remove scale and rust from the hot rolled breakdown coil. As it leaves the pickler the strip is oiled to prevent rusting and to act as a lubricant in the cold rolling mill. The coil is then fed into a continuous cold rolling reducing mill that can contain up to six rolling stands in tandem. Each stand contributes to the reduction in thickness of the material; the first contributes the greatest reduction while the last stand acts as a straightening, finishing, and gauging roll. Unlike hot forming, no scale is formed during this operation. It should be pointed out that the proposed limitations apply only to the wastewaters generated in cold rolling operations, even though other processes may be integrated into a complete "cold mill" complex. The other process wastewaters are being regulated separately.

During cold rolling, the steel becomes quite hard and unsuitable for most uses. As a result, the strip must usually undergo annealing to return its ductility and to effect other changes in mechanical properties. This is done in either a batch or continuous annealing operation.

In batch or box annealing, a large stationary mass of steel is subjected to a long heat treating cycle and allowed to cool slowly. In continuous annealing, a single strip of cold reduced product passes through a furnace in a relatively short period of time. The heat treating and cooling cycle in the furnace is determined by the temperature gradient within the furnace as well as the dimensions and rate of travel of the steel. To prevent oxidation and the formation of scale, inert atmospheres are maintained in these furnaces at all times. Prior to annealing the material must be cleaned of all dirt and oil from the pickling operation to prevent surface blemishes. In the case of the continuous annealing furnaces the material is uncoiled and passes through a continuous cleaning operation prior to entering the furnace. Upon leaving the furnace the material is oiled, recoiled, and is ready to be tempered.

The temper mill is a single stand cold rolling mill designed to produce a slight reduction in thickness of the steel. This reduction develops the proper stiffness or temper by cold working the steel at a controlled rate. The end use of the material dictates the degree of tempering to be performed.

An oil-water emulsion lubricant is sprayed on the material before it enters the rolls of a cold rolling mill and the material is coated with oil prior to recoiling. This oil prevents rust while the material is in transit or in storage and must be removed before the material can be further processed or formed.

As mentioned earlier, there are three types of oil application systems used at cold rolling mills. The diagrams of these systems are shown in Figures III-1 through III-3. Additional details on the cold rolling operation and the three application systems are presented later in this report.

TABLE III-1

BASIC DESCRIPTION OF THE COLD ROLLING OPERATIONS SAMPLED FOR THIS STUDY

Sampling Code (1)	Plant Code (2)	Type of Steel	Type of Oil Application System
D	248B	Specialty	Recirculation
I	432K	Specialty	Recirculation
P	Unk	Specialty	Recirculation
X-2	060B-03	Carbon	Recirculation
BB-2	060-03	Carbon	Recirculation
EE-2	112D-01	Carbon	Recirculation
FF-2	384A(02 & 03)	Carbon	Recirculation
XX-2	684I-01	Carbon	Recirculation
101 A & B	020B & 020C	Specialty	Recirculation
102	384A(02 & 03)	Carbon	Recirculation
104	248B-03	Specialty	Recirculation
105	584F(02,03 & 05)	Carbon	Recirculation
107	176-08	Specialty	Recirculation
VV-2	584F-04	Carbon	Direct Application
105	584F-04	Carbon	Direct Application
106	112B (01 & 03-06)	Carbon	Direct Application
107	176-02	Specialty	Direct Application
DD-2	584E-01	Carbon	Combination
YY-2	432D-01	Carbon	Combination
103	856F-01	Carbon	Combination

---

(1) The sampling code is an alphabetic or numeric code assigned at the time of sampling.

(2) The plant code is a reference code designated for each mill responding to the basic questionnaires. For example, 060B-03 represents the third cold rolling mill at plant 060B.

TABLE III-2

DESCRIPTION OF U. S. COLD ROLLING MILLS

Plant Code	Number of Mills	Type of Rolling Mill					Type of Steel Rolled		Type of Product Rolled(1)								
		Recirculation	Direct Application	Combination	Dry	Unknown	Carbon	Specialty	A	B	C	D	E	F	G	H	I
020B	5	3	1			1		5			2	1	2				
020C	9	9						9	3		6						
020L	1	1						1		1							
060	8	3	5				8		7	1							
060B	3	1	1		1		3		3								
060D	8	6	1			1	1	7	8								
060E	1	1						1	1								
060I	2	2						2						2			
112A	12	1	6		5		12		4	8							
112B	6		6				6		6								
112D	2	1			1		2			1					1		
176	11	7	4					11	11								
248B	6	5				1		6	5		1						
248C	2	2						2									2
256A	2	2					2		2								
256B	1	1					1		1								
256L	1				1			1	1								
256N	24		24					24								24	
2560	5	5						5	5								
284A	4	1	1			2		4	2				2				
320	2	1	1				2		2								
384A	4	2	1		1		4		4								
396D	4	4					4		4								
396E	1	1					1		1								
432A	2	2					2		2								
432B	1	1					1		1								
432C	1	1					1			1							
432D	1			1			1		1								
448A	3	1		2			3			3							
528	5	3			2			5	5								
528B	1	1					1		1								
580C	5	5					5		3					2			
584A	2		1	1			2		1								
584E	5	1	1	2	1		5			5							
584C	1		1				1		1								
584F	6	4	2				6		6								

TABLE III-2
DESCRIPTION OF U. S. COLD ROLLING MILLS
PAGE 2

Plant Code	Number of Mills	Type of Rolling Mill					Type of Steel Rolled		Type of Product Rolled[1]								
		Recir-culation	Direct Application	Combi-nation	Dry	Unknown	Carbon	Specialty	A	B	C	D	E	F	G	H	I
648	3	3					3		1					2			
684B	1	1					1			1							
684C	2		2				2		1	1							
684D	7	7						7	7								
684F	3	2	1				3			3							
684I	2	1	1				2		2								
700	14	8			6		14		14								
724A	2	2					2			2							
760	7	7					7		7								
792C	3	3					3		3								
792B	3	3					3		3								
856D	4			3		1	4		4								
856E	1	1						1	1								
856F	3		1	2			3		3								
856P	21	21					21		21								
860B	4	2	1	1			4		4								
864B	3	3					3		3								
868A	3			3			3		3								
920A	1		1				1		1								
920C	1			1			1		1								
920G	2		2				2		2								
948A	2		2				2		2								
948C	4	1		3			4		4								
TOTAL	253	143	67	19	18	6	162	91	177	29	9	3	2	6	1	24	2
% of Total	100%	56.9%	26.6%	7.5%	6.7%	2.3%	64%	36%	70%	11.5%	3.6%	1.0%	0.8%	2.4%	0.4%	9.5%	0.8%

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[1] Product rolled is identified as follows:

A: Strip	E: Strip, Sheet, Plate
B: Sheet	F: Wire
C: Strip, Sheet	G: Sheet, Tin Plate
D: Sheet, Plate	H: Bar
	I: Other

TABLE III-3

GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION

Plant Code	Age$^{(1)}$	Capacity,$^{(2)}$ tpd	Number of Stands	Applied$^{(3)}$ Flow GPT	Process$^{(4)}$ Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each Direct	POTW	Wastes Hauled
020B-02	1954	969	4	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020B-03	1957	60	1	Unk	Unk	No	H	0	0	Unk
020B-05	1952	306	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-03	1951	75	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-04	1951	81	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-05	1939	45	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-06	1941	39	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-07	1946	576	4	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-08	1950	129	1	Unk	(5)	Yes	Ultra filtration	0	(5)	0
020C-09	1967	843	3	Unk	Unk	No	H	0	0	Unk
020C-02	1941	96	1	Unk	(5)	No	Ultra filtration	0	(5)	0
020C-01	1935	93	1	Unk	(5)	No	Ultra filtration	0	(5)	0
020L-01	1966	186	1	Unk	Unk	No	Unk	0	0	Unk
060-01	1936	2,658	3	543	0.4	Yes	EB,FLP,SS,CL,NL,A,VF	0.4	0	0
060-02	1941	1,974	4	1,168	0.9	Yes	EB,FLP,SS,CL,NL,A,VF	0.9	0	0
060-03	1970	4,803	5	2,889	0.8	Yes	DN,EB,T,FLP,F,P,NL,CL,SL,SS,VF	0.8	0	0
060B-03	1967	2,679	5	Unk	[17.7]	Yes	EB,CF,CL,SS	[17.7]	0	0
060D-02	1929(1961)	402	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-05	1947(1966)	153	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-06	1960	282	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-08	1960	984	4	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-04	1942(1960)	204	1	Unk	Unk	Yes	NL,SL,SS,A	Unk	Unk	0
060D-07	1960	471	1	Unk	Unk	Unk	NL,SL,SS,A	Unk	Unk	0
060E	1972	0	1	Unk	Unk	Unk	Unk	Unk	Unk	0
060I-01	1942	10.8	1	Unk	Unk	No	H	0	0	Unk
060I-02	1966	6	3	Unk	Unk	No	H	0	0	Unk
112A-07	1970	816	1	2,647	3.5	Yes	SS,SCR,NL,A,CY,SL,FLP,FLA	3.5	0	0
112D-01	1965	4,107	5	Unk	[17.5]	Yes	CR,FLP,NL,NW,CL,SL,SS	[17.5]	0	0
176-05	1946	63	1	1,756	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-06	1953	102	1	1,061	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-07	1962	126	1	1,415	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-08	1963	132	1	[900]	[0.9]	Yes	EB,FLP,CL,T,CY	[0.9]	0	0
176-09	1968	39	1	3,375	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-10	1971	4.5	3	776	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-11	1976	60	1	2,970	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
248B-01	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0

TABLE III-3
GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION
PAGE 2

Plant Code	Age(1)	Capacity(2), tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
248B-02	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0
248B-03	NA	NS	3	[66]	[3.5]	Yes	Scr,EB,SS,CY	[3.5]	0	0
248B-04	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0
248B-05	NA	NA	1	Unk	Unk	Yes	Scr,EB,SS,CY	Unk	0	0
248C-01	1940	6.9	2	NA	NA	NA	Process uses no water or emulsions	NA	NA	NA
248C-02	1975	5.7	1	NA	NA	NA	Process uses no water or emulsions	NA	NA	NA
256A-01	1935	138	1	123	0.25	No	SS,H,RUP(99.7)	0	0	0.25
256A-02	1935	138	1	123	0.25	No	SS,H,RUP(99.7)	0	0	0.25
256B-01	1949	186	1	2,333	0.8	No	H,RUP(99.9)	0	0	0.8
256L	1962	27	1	NA	NA	NA	No solutions used	NA	NA	NA
2560-01	1959	*	1	*	*	Yes		*	*	*
2560-02	1961	*	1	*	*	Yes		*	*	*
2560-03	1968	*	1	*	*	Yes		*	*	*
2560-04	1965	*	1	*	*	No		*	*	*
2560-05	1965	*	1	*	*	No		*	*	*
284A-01	1957	219	1	Unk	0.10	No	H	0	0	0.10
320-02	1961	3,294	4	874	1.9	Yes	H,RUP(99.8)	0	0	1.9
384A-02	1958	3,354	4	3,867	43	Yes	EB,CL,SS,RUP(98.9)	43	0	0
384A-03	1970	5,757	5	3,761	10	Yes	EB,FL,FLP,CL,SS,RUP(99.7)	10	Unk	0
396D-01	1938	69	1	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396D-02	1940	246	4	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396D-03	1948	87	5	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396D-04	1954	3	1	Unk	Unk	Yes	SSP,SS	Unk	Unk	0
396E	1954	240	4	Unk	Unk	Yes	No Treatment	Unk	0	0
432A-01	1947(1971)	1,911	5	Unk	Unk	Yes	GF,E,T,NC,SCR,CL,SS,VF,H,NL	Unk	0	0
432A-02	1963	906	3	Unk	Unk	Yes	GF,E,T,NC,NL,SCR,CL,SS,VF,H	Unk	0	0
432B-01	1937(1949)	1,827	4	Unk	Unk	Yes	EB,VF,SS	0	Unk	0
432C-01	1957	3,132	4	Unk	Unk	Yes	VF,FLL,FLP,NN,CL,PSP,SS,OB,CT	Unk	0	0
448A-03	1967	780	1	Unk	Unk	Yes	CL	0	Unk	0
528-01	1955	153	1	Unk	0.03	Yes	EB,GF,CNT,RUP	0	Unk	0.03
528-02	1955	243	1	Unk	0.02	Yes	EB,CF,RUP,BD,CNT	0	Unk	0.02
528-03	1947	51	1	Unk	0.09	Yes	EB,GF,RUP,BF,CNT	0	Unk	0.09
528B-01	1954	2,862	4	Unk	30.2	Yes	NC,SS,SL,RUP,BD,CNT (2)	30.2	0	0

TABLE III-3
GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION
PAGE 3

Plant Code	Age(1)	Capacity,(2) tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
580C-01	1957	6	3	7,365	12.5	No	SS,RUP(99.9),BD(0.03)	0	0	12.5
580C-02	1975	6	3	1,733	12.5	No	SS,RUP(99.9),BD(0.08)	0	0	12.5
580C-03	1952	54	1	3,683	0.12	No	RUP(99.9),BD(0.003)	0.06	0.06	0
580C-04	1959	27	1	6,776	0	No	RUP(100)	0	0	0
580C-05	1964	67.5	1	1,067	0	No	RUP(100)	0	0	0
584E-03	1961(1972)	870	2	Unk	Unk	Yes	BO,CO,CR,DW,EB,F,P,FLL,FLP,IY, NL,NW,CL,SL,SS	Unk	0	0
584F-02	1947(1966)	1,494	5	Unk	(6)	Yes	SS,SL,CNT	(6)	0	0
584F-03	1956(1966)	1,965	5	Unk	(6)	Yes	SS,SL,CNT	(6)	0	0
0584F-05	1975	1,164	5	Unk	(6)	Yes	SS,SL,CNT	(6)	0	0
0584F-07	1966	990	2	Unk	Unk	Yes	SS,SL,CNT	Unk	0	0
648-01	1969	45	1	Unk	Unk	No	PSP	0	Unk	0
648-02	1966	4.5	3	Unk	Unk	No	PSP	0	Unk	0
648-03	1975	18	3	Unk	Unk	No	PSP	0	Unk	0
684B-01	1957(1961)	1,569	4	3,578	138	Yes	SL,SS,CNT,RUP(96),BD(4)	138	0	0
684D-01	1939	129	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-02	1939	63	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-03	1939	24	1	Unk	(7)	Yes	EB,SS,CL,BD,CNT,RUP	(7)	0	0
684D-04	1948	90	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-05	1946	369	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-06	1946	177	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684D-07	1946	159	1	Unk	(7)	Yes	EB,SS,SL,BD,CNT,RUP	(7)	0	0
684F-02	1953	1,740	4	12,006	8.7	Yes	CO,FLL,FLP,GF,F,HL,NW,SL,CNT, RUP(99.9)	8.7	0	0
684F-03	1969	3,597	5	Unk	4.3	Yes	CL,F,FLL,FLP,GF,FOl,HL,NW,SL, CNT,RUP	4.3	0	0
684I-01	1958	1,149	4	3,595	751	Yes	NW,PSP,SSP,SS,CNT,RUP(75.1), BD,SL	751	0	0
700-(01-06)	Unk	Unk	1(each)	Unk	Unk	NA	No treatment	Unk	0	0
700-10	Unk	Unk	1	Unk	Unk	NA	No treatment	Unk	0	0
700-11	1974	Unk	1	Unk	Unk	NA	No treatment	Unk	0	0
724A-01	1964	510	1	Unk	Unk	Yes	No treatment	Unk	0	0
724A-02	1966	1,851	5	Unk	Unk	Yes	No treatment	Unk	0	0
760-01	1950	261	1	1,655	16.6	Unk	FF,RUP(93)	16.6	0	0
760-02	1957	165	1	2,618	26.3	Unk	FF,RUP	0	0	26.3
760-03	1954	156	1	0	0	NA	No rolling solutions used	0	NA	NA

TABLE III-3
GENERAL SUMMARY TABLE
COLD ROLLING - RECIRCULATION
PAGE 4

				Applied[(3)] Flow	Process[(4)] Waste Flow			Discharge Mode With Typical GPT for Each		
Plant Code	Age(1)	Capacity(2), tpd	Number of Stands	GPT	GPT	Central Treatment	Control & Treatment Technology	Direct	POTW	Wastes Hauled
760-04	1926(1952)	42	1	0	0	NA	No rolling solutions used	0	NA	NA
760-05	1927(1963)	1.8	1	0	0	NA	No rolling solutions used	0	NA	NA
760-06	1927(1953)	20.4	1	0	0	NA	No rolling solutions used	0	NA	NA
760-07	1944(1965)	12.3	1	0	0	NA	No rolling solutions used	0	NA	NA
792B-01	1952	369	1	Unk	Unk	No	H	0	0	Unk
792B-02	1945	132	1	Unk	Unk	No	H	0	0	Unk
792B-03	1961	165	1	Unk	Unk	No	H	0	0	Unk
792C-01	1955	204	1	593	Unk	Yes	SS,F,CNT	Unk	0	0
792C-02	1970	120	1	1,080	Unk	Yes	SS,F,CNT	Unk	0	0
792C-03	1963	51	1	734	Unk	Yes	SS,F,CNT	Unk	0	0
856E-01	1946	249	1	1,439	Unk	No	H	0	0	Unk
856P (01-21)	1909(1918)	822(comb.)	1(each)	4,390 (comb)	0.8	Yes	H,RUP(99.9)	0	0	0.8
860B-02	1967	2,244	6	Unk	1,283	Yes	EB,SS,FLL,FLP,NW,CL	1,283	0	0
860B-04	1964	4,194	5	Unk	687	Yes	EB,SS,FLL,FLP,NW,CL	687	0	0
864B-01	1947	1,419	5	3,552	5.1	Yes	FLL,FLP,NL,NA,CL,NO_3,SS,CNT, RUP(99.9)	5.1	0	0
864B-02	1965	813	3	3,542	354	Yes	NL,NA,CL,NO_3,SS,CNT,RUP(90)	354	0	0
864B-03	1974	1,986	5	3,625	7.3	Yes	NL,NA,CL,NO_3,SS,CNT,RUP(99.9)	7.3	0	0
948C-03	1939(1966)	894	3	3,624	1369	Yes	T,SS,FLP,FLL,CNT,RUP(62)	1,369	0	0

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(1) The age listed represents the first year of production. Number in parentheses designate years of rebuilds or major modifications.
(2) The daily capacity listed was determined by multiplying the 1976 average tonnage per turn by a factor of three.
(3) The applied flow represents the total process water flow applied to the cold rolling mill.
(4) The process water flow represents the water leaving the cold rolling mill after any internal recycle systems.
(5) Flow value measured during sampling visit for these 10 mills equals 11.0 gpt.
(6) Flow value measured during sampling visit for these 3 mills equals 1.0 gpt.
(7) Company reports total flow for all seven mills. The flow rate is equivalent to 5.7 gpt.
*: Confidential
: Flow values in brackets were received at plant visits or in the response to D-DCP's.

NOTE: For a definition of the C&TT Codes, see Table VII-1.

TABLE III-4

GENERAL SUMMARY TABLE
COLD ROLLING - COMBINATION

Plant Code	Age(1)	Capacity(2),tpd	Total Number of Stands	Number of Recirculated Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode with Typical GPT for Each: Direct	POTW	Wastes Hauled
0432D-01	1968	3,486	5	3	Unk	[130]	Yes	DW,F,P,FLL,T	[130]	0	0
0448A-01	1952(65)	1,488	5	4	Unk	Unk	Yes	CL	Unk	Unk	0
0448A-02	1966	624	3	2	Unk	Unk	Yes	CL	Unk	Unk	0
0584A-02	1965	4,437	5	4	Unk	130	Yes	M,A,E,EB,FLL,FLP,NL,SCR,T,SS,OT	130	0	0
0584E-01	1961	2,004	5	4	Unk	[512]	Yes	BO,CU,CR,DW,EB,F,P,FLL,FLP,GF,IX,NL,NW,CL,SL,SS	[512]	0	0
0584E-04	1970	3,999	5	3	Unk	Unk	Yes	BO,CO,CR,DW,EB,F,P,FLL,FLP,GF,IX,NL,NW,CL,SL,SS	Unk	0	0
0856D-01	1938(75)	1,092	5	4	Unk	Unk	Yes	EB,FLP,FLO1,SS,CNT	Unk	0	0
0856D-02	1940(55)	1,482	5	4	Unk	Unk	Yes	EB,FLP,FLO1,SS,CNT	Unk	0	0
0856D-03	1971	4,620	5	3	Unk	Unk	Yes	EB,FLP,FLO1,SS,CNT	Unk	0	0
0856F-01	1953	3,132	4	3	552	[112]	Yes	CR,NW,FLL,T,CL,CNT,RUP(83)	[112]	0	0
0856F-02	1953	1,782	5	4	970	179	Yes	CR,NW,FLL,T,CL,CNT,RUP(82)	179	0	0
0860B-03	1948	3,105	4	2	14,235	325	Yes	EB,FLL,FLP,NL,NW,CL,SL,RUP(98),CNT(5)	325	0	0
0868A-01	1948	2,658	4	3	Unk	54	Yes	F,FLP,FLO1,NL,CL,SL,SS,CNT	54	0	0
0868A-02	1963	1,674	6	5	Unk	481	Yes	F,P,FLP,FLO1,CL,SL,SS,CNT	481	0	0
0868A-03	1964	570	2	1	Unk	25	Yes	F,P,FLP,FLO1,CL,SL,SS,CNT	25	0	0
0920C-01	1954	2,121	4	3	1,630	114	Yes	EB,VF,SS,CNT,RUP(99)	114	0	0
0948C-01	1954	2,730	2	4	1,477	870	Yes	T,FLP,FLL,CNT,RUP(50)	870	0	0
0948C-02	1965	3,438	5	4	503	293	Yes	F,S,FLA,FLO1,CNT,RUP(42)	293	0	0
0948C-04	1961	2,082	5	4	8,127	1,245	Yes	T,SS,RUP(85)	1,245	0	0

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(1) The age listed represents the first year of production. Numbers in parentheses designate years of rebuilds or major modifications.

(2) The daily capacity listed was determined by multiplying the 1976 average tonnage per turn by a factor of three.

(3) The applied flow represents the total process water flow applied to the cold rolling mill.

(4) The process water waste flow represents the water leaving the cold rolling mill after any internal recycle systems.

: Flow values in brackets were received at plant visits or in the responses to D-DCP's.

NOTE: For a definition of the C&TT Codes, see Table VII-1.

TABLE III-5

GENERAL SUMMARY TABLE
COLD ROLLING - DIRECT APPLICATION

Plant Code	Age(1)	Capacity(2), tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each Direct	POTW	Wastes Hauled
020B-04	1957	30	1	Unk	Unk	No	H	Unk	0	Unk
060-04	1940	246	1	Unk	Unk	Yes	VF,FLP,NL,T,A,SS	Unk	0	0
060-05	1938	1,308	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060-06	1942	948	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060-07	1956	2,529	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060-08	1966	2,292	1	Unk	Unk	Yes	EB,FG,FLP,NL,CL,SS,A	Unk	0	0
060B-01	1963	1,146	1	Unk	Unk	Yes	EB,GF,CL,SS	Unk	0	0
060D-01	1926(1929) (1948)	NA	1	Unk	Unk	Yes	NL,SL,A	Unk	0	0
060D-03	1929(1958)	408	1	Unk	Unk	Yes	NL,SL,A	Unk	0	0
112A-01	1947(1951)	1,524	5	481	481	Yes	SS,SCL,NL,A,SL,CY,FLP,GLA	481	0	0
112A-02	1951	2,811	4	246	246	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	246	0	0
112A-03	1936	1,230	5	Unk	Unk	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	Unk	0	0
112A-04	1936	1,230	5	Unk	Unk	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	Unk	0	0
112A-05	1957	1,968	5	3,081	3,081	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	3,081	0	0
112A-06	1963	861	2	607	607	Yes	SS,SCR,NL,A,SL,CY,FLP,GLA	607	0	0
112B-01	1936(1950)	2,856	4	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-02	1936(1963)	2,310	4	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-03	1936	1,680	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-04	1936	1,392	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-05	1936	1,968	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
112B-06	1936	1,944	1	(5)	(5)	Yes	F,S,NL,CL,SS,A	(5)	0	0
176-01	1921(1928)	630	1	Unk	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-02	1929	63	1	[233]	[233]	Yes	EB,FLP,CL,T,CY	[233]	0	0
176-03	1933	NA	1	Unk	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
176-04	1934	3.0	1	Unk	Unk	Yes	EB,FLP,CL,T,CY	Unk	0	0
256N-(01-24)	1928	1.5(each)	1(each)	Unk	Unk	Yes	SS	Unk	0	0
284A-02	1957	186	1	0.5	0.5	Yes	No treatment(no oil solutions used in process)	0.5	0	0

TABLE III-5
GENERAL SUMMARY TABLE
COLD ROLLING - DIRECT APPLICATION MILLS
PAGE 2

Plant Code	Age(1)	Capacity,(2) tpd	Number of Stands	Applied(3) Flow GPT	Process(4) Waste Flow GPT	Central Treatment	Control & Treatment Technology	Discharge Mode With Typical GPT for Each: Direct	POTW	Wastes Hauled
320-01	1936(1961)	2,310	3	Unk	Unk	Unk	H	Unk	0	Unk
384A-01	1933(1948)	1,356	5	262	262	Yes	SL,SS	262	0	0
584A-01	1948	1,491	3	603	603	No	SS,OT	603	0	0
584C-01	1947	2,103	4	1,426	1,426	Yes	SS,SL,CLB,FDS,CNT	1,426	0	0
584E-02	1961	2,256	1	Unk	Unk	Yes	BO,CO,CR,DN,EB,FLL,FLP,GF,NL, NW,SL,SS	Unk	0	0
584F-04	1959	1,842	4	[424]	[424]	Yes	SS,SL,CNT,EB,GF,NL	[424]	0	0
584F-06	1972	1,107	2	Unk	Unk	Yes	SS,SL,CNT,EB,GF,NL	Unk	0	0
684C-01	1937	126	4	Unk	Unk	Yes	PSP,SS,OT,CNT,T	Unk	0	0
684C-02	1964	1,017	2	142	142	Yes	PSP,SS,OT,CNT,T	142	0	0
684I-02	1958	951	1	23	23	Yes	NW,PSP,SSP,SS,SL,OT,CNT	23	0	0
856F-03	1962	804	2	287	287	Yes	CR,NW,NL,FLL,T,CL,CNT	287	0	0
860B-01	1963	855	2	168	168	Yes	EB,SS,FLL,FLP,NW,CL	168	0	0
920A-01	1930(1939)	1,953	4	273	273	Yes	CO,FLL,NL,CL,CNT	273	0	0
920G-01	1937(1964)	318	3	1,604	1,604	Yes	EB,GF,CL,SS,CNT	1,604	0	0
920G-02	1957	2,031	5	1,477	1,477	Yes	EB,GF,CL,SS,CNT	1,477	0	0
948A-01	1935	1,380	3	939	939	Yes	EB,VF,GF,SS,FLP,FLL,FL	939	0	0
948A-02	1937	1,500	4	864	864	Yes	EB,VF,GF,SS,FLP,FLL,FL	864	0	0

---

(1) The age listed represents the first year of production. Numbers in parentheses designate years of rebuilds or major modifications.
(2) The daily capacity listed was determined by multiplying the 1976 average tonnage per turn by a factor of three.
(3) The applied flow represents the total process water flow applied to the cold rolling mill.
(4) The process flow represents the total process water flow leaving the process and entering the treatment system, if any.
(5) Plant 112B reported a total flow for the six mills: 01-06. The applied, process and discharge flows for these mills was calculated by using a coubined tonnage and equals 238 gal/ton.
: Flow values in brackets were received during plant visits or in the response to D-DCP's.

NOTE: For a definition of C&TT Codes, see Table VII-1.

TABLE III-6

COLD ROLLING - RECIRCULATION DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity * of Operations (Tons)	% of Total Daily Capacity
Operations Sampled for Original Guidelines Study	6	3.6	12,335	12.9
Operations Sampled For Toxic Pollutant Study	19	11.3	16,657	17.5
Total No. of Operations Sampled	25	14.9	28,992	30.4
Operations Solicited via Detailed DCP	20 incl. 13 above	11.9 incl. 7.7 above	26,868 incl. 12,550 above	28.2 incl. 13.2 above
Operations Sampled and/or Solicitated via Detailed DCP	32	19.0	43,310	45.4
Operations Responding to DCP's	143	~85.0	81,086	~85.0
Estimated Total Number of Recirculation Operations	168	100.0	95,395	100.0

---

* Capacities for 1976 were used to determine the appropriate daily capacities.

TABLE III-7

COLD ROLLING - COMBINATION DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity * of Operations (Tons)	% of Total Daily Capacity
Operations Sampled for Original Guidelines Study	2	9.1	6,065	11.0
Operations Sampled For Toxic Pollutant Study	1	4.5	3,132	5.7
Total No. of Operations Sampled	3	13.6	9,197	16.8
Operations Solicited via Detailed DCP	0	0	0	0
Operations Sampled and/or Solicited via Detailed DCP	3	13.6	9,197	16.8
Operations Responding to Basic DCP's	19	~85.0	46,514	~85.0
Estimated Total Number of Combination Operations	22	100.0	54,722	100.0

---

*Capacities for 1976 were used to determine the appropriate daily capacities.

TABLE III-8

COLD ROLLING - DIRECT APPLICATION DATA BASE

	No. of Operations	% of Total No. of Operations	Daily Capacity ** of Operations (Tons)	% of Total Daily Capacity
Operations Sampled for Original Guidelines Study	0*	0	0	0
Operations Sampled For Toxic Pollutant Study	7	8.9	11,220	17.3
Total No. of Operations Sampled	7	8.9	11,220	17.3
Operations Solicited via Detailed DCP	11 incl. 1 above	13.9 incl. 1.3 above	16,023 incl. 1,380 above	24.7 incl. 2.1 above
Operations Sampled and/or Solicited via Detailed DCP	17	21.5	25,863	40.0
Operations responding to DCP's	67	~85.0	55,000	~85.0
Estimated Total Number of Direct Application Operations	79	100.0	64,700	100.0

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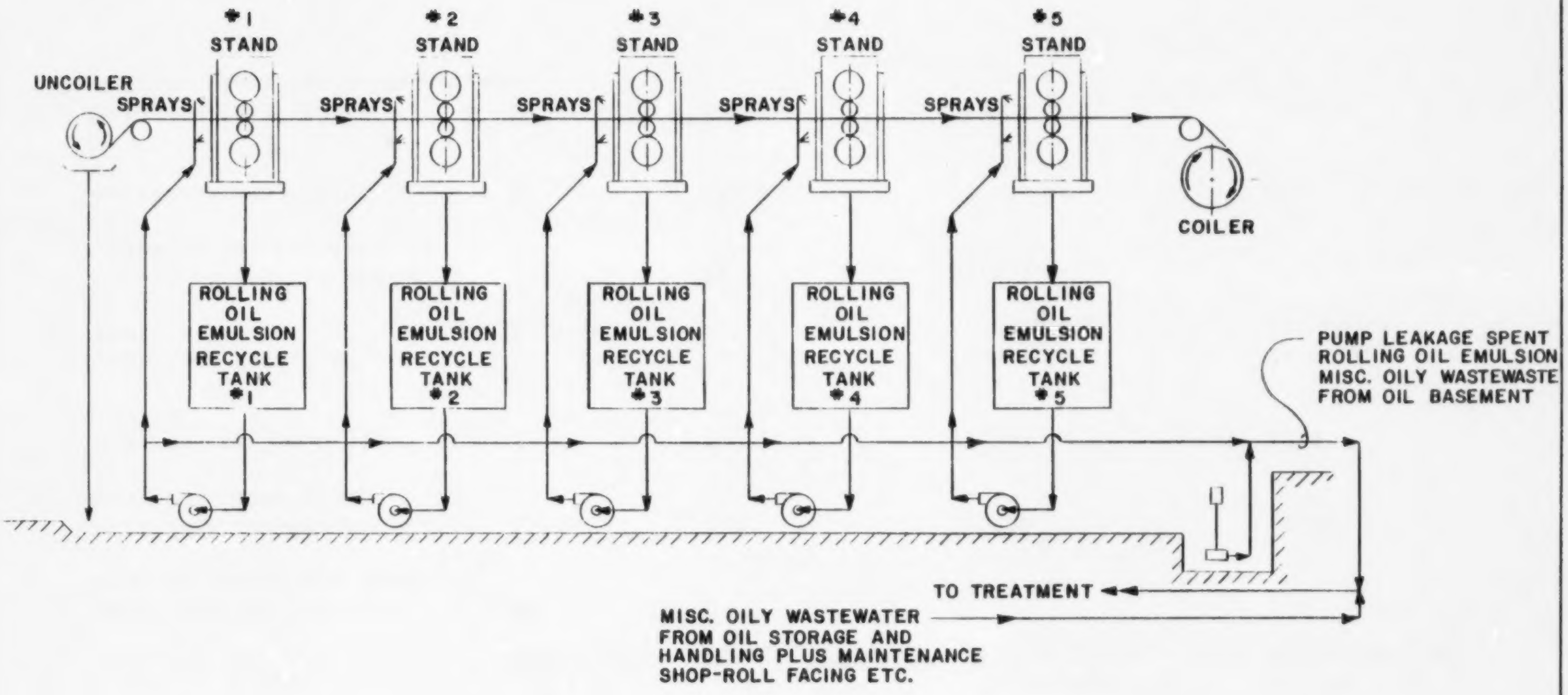
* One direct application operation was sampled for the original study. However, this mill was resampled for this study and only the newer data was used for the updated data base.

**Capacities for 1976 were used to determine the appropriate daily capacities.

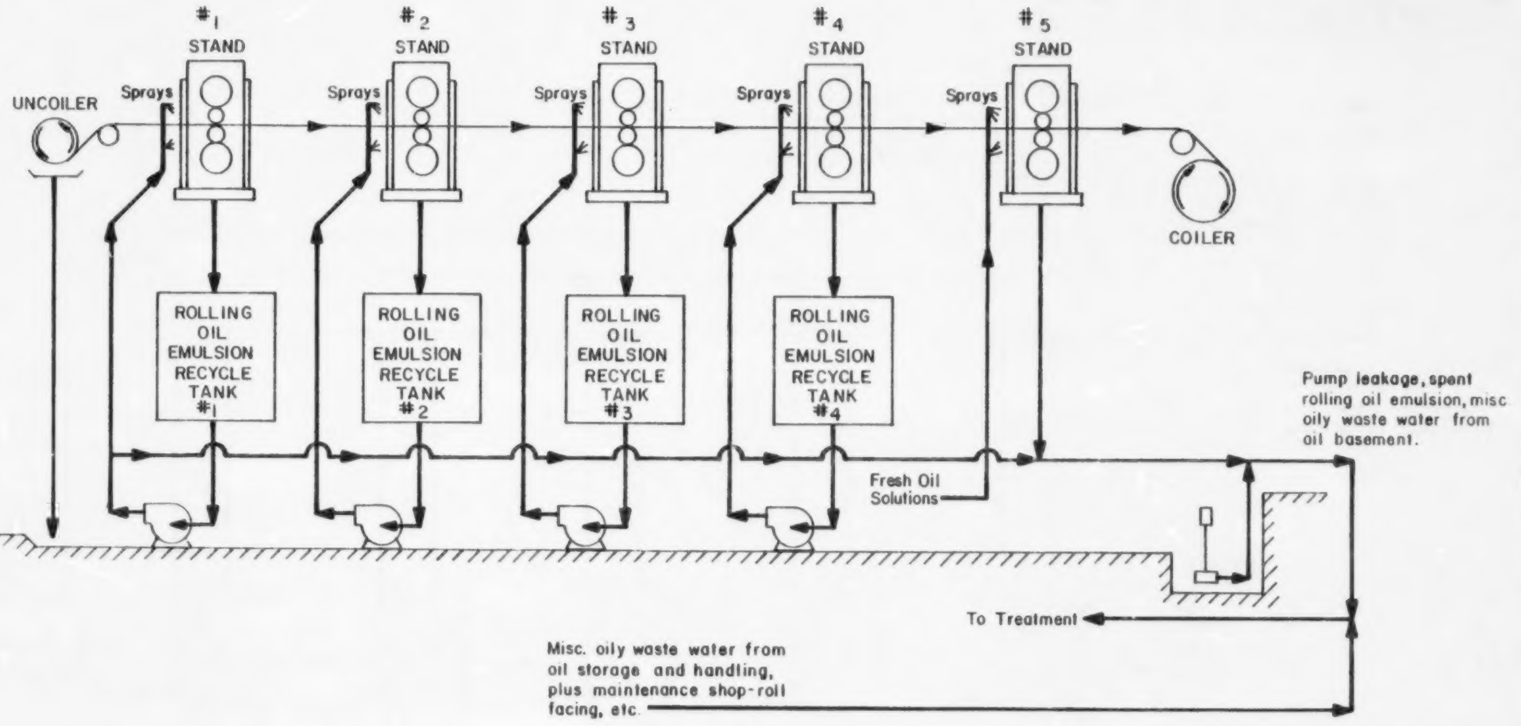

UNCOILER
SPRAYS
*1 STAND
SPRAYS
*2 STAND
SPRAYS
*3 STAND
SPRAYS
*4 STAND
SPRAYS
*5 STAND
COILER
ROLLING OIL EMULSION RECYCLE TANK *1
ROLLING OIL EMULSION RECYCLE TANK *2
ROLLING OIL EMULSION RECYCLE TANK *3
ROLLING OIL EMULSION RECYCLE TANK *4
ROLLING OIL EMULSION RECYCLE TANK *5
PUMP LEAKAGE SPENT ROLLING OIL EMULSION MISC. OILY WASTEWASTE FROM OIL BASEMENT
TO TREATMENT
MISC. OILY WASTEWATER FROM OIL STORAGE AND HANDLING PLUS MAINTENANCE SHOP-ROLL FACING ETC.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING MILL
RECIRCULATION TYPE
PROCESS FLOW DIAGRAM

DWG.5/11/74 REV.2/25/76
REV.2/19/76

FIGURE III-1

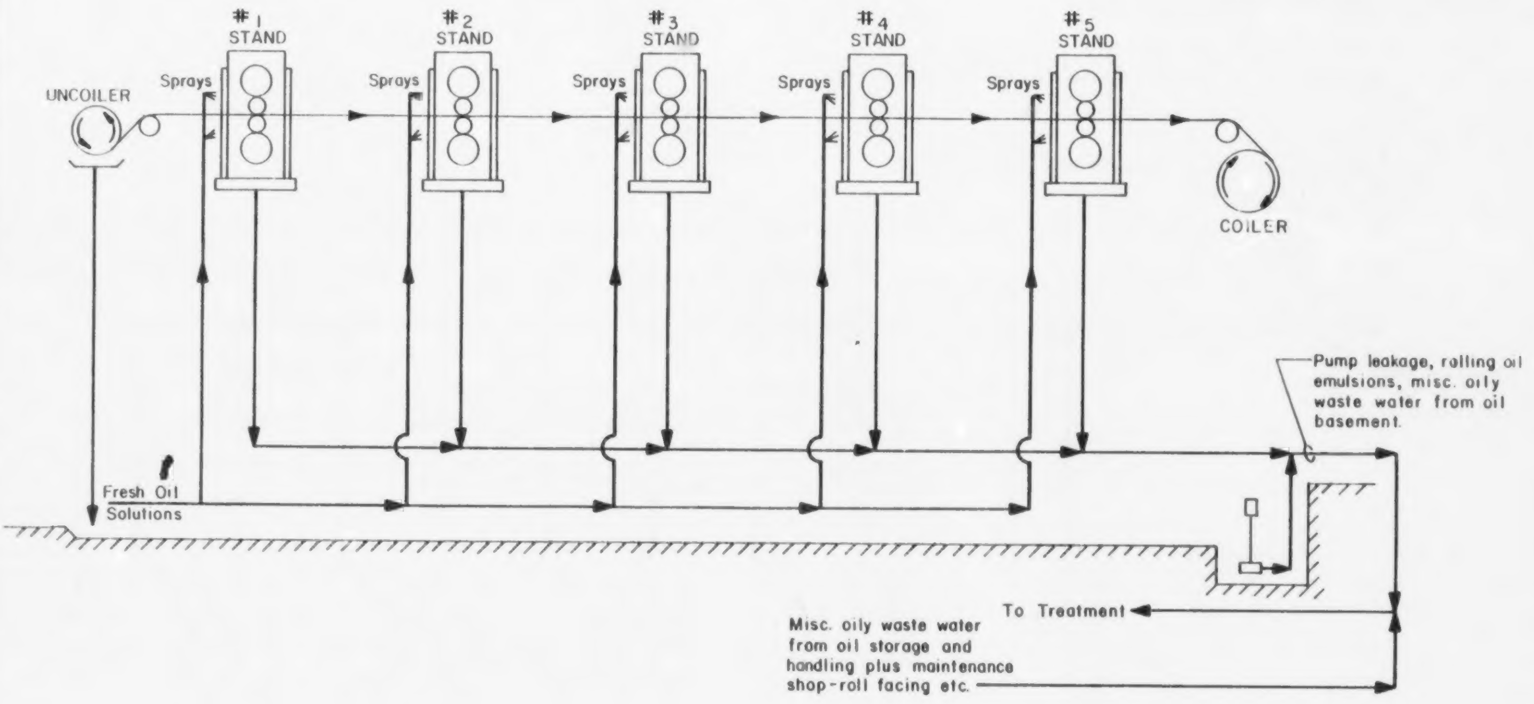

#1 STAND
#2 STAND
#3 STAND
#4 STAND
#5 STAND
UNCOILER
Sprays
Sprays
Sprays
Sprays
Sprays
COILER
ROLLING OIL EMULSION RECYCLE TANK #1
ROLLING OIL EMULSION RECYCLE TANK #2
ROLLING OIL EMULSION RECYCLE TANK #3
ROLLING OIL EMULSION RECYCLE TANK #4
Pump leakage, spent rolling oil emulsion, misc oily waste water from oil basement.
Fresh Oil Solutions
To Treatment
Misc. oily waste water from oil storage and handling, plus maintenance shop-roll facing, etc.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING MILL
COMBINATION TYPE
PROCESS FLOW DIAGRAM

Dwn.6/5/79

FIGURE III-2


UNCOILER
Sprays
#1 STAND
Sprays
#2 STAND
Sprays
#3 STAND
Sprays
#4 STAND
Sprays
#5 STAND
COILER
Fresh Oil Solutions
Pump leakage, rolling oil emulsions, misc. oily waste water from oil basement.
To Treatment
Misc. oily waste water from oil storage and handling plus maintenance shop-roll facing etc.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING MILL
DIRECT APPLICATION TYPE
PROCESS FLOW DIAGRAM

Dwn. 6/6/79

FIGURE III - 3

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION IV

SUBCATEGORIZATION

Introduction

For cold rolling operations, the main element that affects segmentation is the method of oil application. Flow rates were found to differ depending on the oil application system used. Hence, proposed limitations were developed separately for recirculation, combination, and direct application mills.

Basically, the difference in flow rates is the only factor affecting segmentation of the cold rolling subdivision. Mill age and size, product type, raw materials, wastewater characteristics, treatability, and geographic location were considered but the analysis showed that none of these factors would warrant further segmentation of the cold rolling subdivision. Each of these elements is reviewed below.

Factors Considered in Subcategorization

Manufacturing Process and Equipment

To determine if this factor had an affect on segmentation of cold rolling operations, the Agency analyzed two elements. First, it was thought that the type of cold rolling done (i.e., temper, tandem, or reversing mill) might affect flow rates or discharge quality. The second relationship examined was the configuration of the mill itself, such as the number of stands present. These elements are discussed below.

A. Type of Cold Rolling

The Agency analyzed both the sampling data and the DCP responses and found no relationship between the type of mill (e.g., temper or tandem), and either the water flow rates or effluent quality. Although most mills were identified only as "cold mills," data for mills that were clearly identified showed no correlations that indicated that further subcategorization would be appropriate. For example, mills that perform large thickness reductions discharge similar flows and achieve similar effluent quality as those mills, such as skin mills, which perform small thickness reductions.

B. Mill Configuration

The Agency also examined the effect of the number of mill stands on wastewater quality and quantity. All three types of mills were examined. The mills analyzed varied from small one stand operations to large six stand complexes. To determine if the number of stands affected flow rate, the flow data for all mills were tabulated according to the number of stands present, and then compared to the model flows considered for the three mill types. These data are shown in Table IV-1.

In all cases, the mills with the fewest number of stands achieve the proposed flow rates. However, a large number of the multi-stand mills achieve the same flow rates. While lower model flows may be used to develop limitations for one stand cold rolling mills, the Agency decided to use one model flow for mills of all sizes. The model flow values used as the basis for the proposed limitations are well demonstrated by all types of cold rolling operations and by mills using multi-stand arrangements. As a final note, it is quite possible for a one stand mill to use as much water as a five stand mill if this mill is required to pass the product through the one stand numerous times to achieve the needed thickness reduction and surface quality. For these reasons, the proposed limitations do not differentiate between mills of different configurations.

The data were also analyzed to determine if mill configuration has an effect on wastewater quality. Of the mills sampled, most were five stand mills. However, there were a few mills with fewer stands and some with more than five stands. The raw waste data do not show any significant variations with mill configuration. Similar types of oils are used regardless of the number of mill stands, and notwithstanding equalization facilities at some mills, concentrations of conventional pollutants (i.e., TSS and oil & grease) are relatively consistent among similar type mills (i.e., recirculation, DA). The sampling data demonstrate that acceptable effluent quality is dependent on treatment system design and operation and not on mill configuration.

Final Product

Cold rolling operations yield a wide variety of final products (see Table III-2). An analysis was done to determine if the final product rolled (e.g., sheet, strip) affected flow rates, wastewater characteristics or other elements. The three main products analyzed were sheet, strip, and flat wire. These three products account for 83% of the total tonnage reported by the industry. Others were not addressed because of the multiple products rolled at these mills, or because flow rates and other analytical data are not available. The data show that the final product rolled does not have a significant affect on either discharge flow or wastewater characteristics. Hence, further segmentation on this basis is not warranted.

Strip and sheet mills were first analyzed because of their similarities. The data indicate that more strip mills use recirculation systems while more sheet mills are direct application mills. This resulted in a slightly higher average applied flow rates for the sheet mills. This difference, however, is not significant and is covered by the basic segmentation by mill type. Aside from high levels of toxic organic pollutants found in recirculated mills for all products, no differences were found in the wastewater characteristics between the two mills. In addition, the ability to achieve the model system flow rates is well demonstrated for both types of mills.

Wire mills are usually small operations with capacities in the range of hundreds of tons per year as opposed to other operations which produce many thousands of tons per year. Also, reported applied flow rates are significantly higher at flat wire mills than at any other type of cold mill operation. For example, an applied rate of 195,000 GPT was reported for one wire mill. This is approximately 40 times the highest flow rate reported by either a strip or sheet mill. The reason for these higher than normal flow rates is the small capacity of these mills and not any special water requirements. Wire mills only process products in small batches. Also, when the mill is operated, it is run for only a small portion of a turn. When the flow values were calculated on a gallon/ton basis it was assumed that the mill operated for an entire eight hour turn. Since this is not the case for wire mills, the calculated applied flow rates are disproportionately higher than for any other types of mills types. Despite these inordinately high calculated applied flows, the Agency found that recirculating mills of all types achieve the model flow used to develop the proposed limitations. Hence, it is not necessary to differentiate between products rolled at cold mill operations.

Raw Materials

Carbon, stainless and other types of steel are used as raw material in cold rolling mills. For this study, the Agency defined any mill producing more than 50% carbon steel as a "carbon steel mill" and, any mill producing less than 50% of its output as carbon steel as a "specialty steel mill." It was found that while the type of steel rolled sometimes affects mill operation, it does not affect the eventual discharge quantity. Accordingly, the Agency concluded that further segmentation based upon type of raw material used (i.e., the type of steel rolled) is not appropriate.

Although the data from the sampling results and DCPs do not show any significant differences based upon raw material, some interesting trends were observed. Specialty steel cold rolling mills, on average, are 10 times smaller than the average carbon steel mill. The average yearly capacity for a specialty mill is 35,950 tons while carbon steel mills have an average yearly capacity of 364,505 tons. This size relationship results from the fact that at a given plant specialty steel production is generally on a much smaller scale than carbon steel production. Thus, the cold reduction operation is limited by the initial raw steel production.

When the discharge flow rates for the carbon and specialty operations were compared, no significant differences were found. In fact, both types of mills have similar average flow rates and ranges of values. It should be noted that this analysis was limited to recirculation mills since there is only one specialty mill with available flow data among the direct application and combination mills.

The data for the two types of mills are summarized below:

	Average Discharge Flow Rate (GPT)*	Standard Deviation
Carbon Mills	8.9	11.1
Specialty Mills	9.2	15.8

* Average of the best flow values. See Section X for additional details.

Wastewater Characteristics

Within the cold rolling subdivision, differences were found in wastewater characteristics between operations that process specialty steels and those that process carbon steels. The Agency found that operations processing specialty steel products generate higher levels of chromium, copper, lead, nickel, and zinc than do carbon mills. However, as explained below, this neither affected the selection of treatment components nor the development of appropriate effluent limitations.

Specialty steels are produced by adding alloying agents to the steel as it is being produced. These steels normally contain higher levels of certain metallic elements such as chromium and nickel which give the steel added properties. Because the specialty steels contain these metals, there is a greater tendency for them to be released as they progress through steel finishing operations, such as cold rolling.

The data gathered during the sampling visits demonstrate that wastewaters from specialty operations contain higher concentrations of certain metals than do wastewaters from carbon steel operations. The data presented below for recirculation mills illustrates this point.

	Carbon Steel Operations		Specialty Steel Operations	
	Ave. Conc. (mg/l)	Max. Conc. (mg/l)	Ave. Conc. (mg/l)	Max. Conc. (mg/l)
Chromium	0.01	0.03	5.3	10.4
Copper	1.4	2.0	11.7	28.4
Lead	1.3	2.3	3.1	10.4
Nickel	0.6	0.9	5.8	11.5
Zinc	0.5	0.5	5.7	9.5

As can be seen by these data, mills that process specialty steels generate, on average, 2.4 (lead) to 530 (chromium) times as much metals as do the carbon steel mills.

The Agency is not proposing BPT limitations for the metals since the Agency has decided to retain the original list of limited pollutants at this level of treatment. However the Agency is proposing BAT, NSPS, PSES, and PSNS limitations and standards for certain "indicator" metals. Since the metals are principally in particulate form, the treatment technology considered for metals removal at the above mentioned treatment levels will result in similar treated effluent quality for both carbon and specialty mills.

For the other pollutants found in the cold rolling wastes, no differences were found based on product type. The previously limited pollutants (i.e., total suspended solids, oil and grease) were found at similar levels at most operations. Some waste streams are more concentrated than others because of collection practices at some mills. Depending on the product being rolled, different oils and greases are used at different mills and within a given mill. The oils and greases are proprietary in nature and are chosen mainly for their lubricating and cooling properties. Subcategorization on the basis of the various types of oils used is not practical due to the complex nature of those oils and data availability concerning characterization. It was found that acceptable levels of oil and grease can be attained in the discharge provided adequate oil separation and removal is practiced.

Various toxic organic pollutants found are believed to result from the oils used in the mills. The characteristics of the wastewaters from mills using different oil mixtures was quite varied. Different organic pollutants were detected at the mills sampled. Since the presence of these compounds is widespread among recirculation and combination mills, and they were generally not found in direct application mills, the basic segmentation of the cold rolling subdivision noted above sufficiently accounts for this difference.

Wastewater Treatability

The Agency analyzed the treatability of the wastewater from different cold rolling operations. It found that there is no significant difference in treatability from the three segments, except as noted above for toxic organic pollutants. If adequate treatment is installed, the proposed levels of effluent quality can be attained. Because of differences in flow rates, treatment systems must be sized accordingly, but this does not affect treatability of the wastewater. It was found, however, that some mills can use non-emulsifiable oils on their rolling stands. For these mills some of the emulsion breaking steps proposed in the treatment schemes are not needed.

Size and Age

The Agency considered whether size and age might affect segmentation of cold rolling operations. It analyzed various relationships dealing with possible correlations between the effect of age and size on elements such as wastewater generation, the ability to install treatment, and the ability to recycle wastes adequately to achieve desired flow rates. However, the analysis does not show any relationships that affects the segmentation beyond that already considered.

Size was considered as a possible factor for segmentation. The cold rolling mills vary greatly in physical size, layout and product size. However, these considerations revealed no significant relationships to process water usage, discharge rates, effluent quality or any other pertinent factors. Figures IV-1 through IV-3 show plots which analyze the possible relationship between discharge flow and size. On the plots, the model flow rates used as the basis for the proposed BAT limitations are also shown. As can be seen, mills of all sizes achieve the model flows.

There is a slight correlation between mill size and age. The 25 largest mills have an average age (not counting rebuilds) of 18.5 years while the 25 smallest mills have an average age of 27 years. This shows that as technology and material resource requirements increased over the years, the size of an average cold rolling mill gradually increased to accommodate the higher demand for cold rolled products and to take advantage of the economy associated with the larger mills.

The relationship between flow and age was analyzed in the same way as the flow vs. size relationship. The plots of flow vs. age for the three types of cold rolling mills are shown in Figures IV-4 through IV-6. No relationship between flow and age is evident. Hence, the age of a mill has no significant impact on the discharge flow from that mill.

The effect of age on the ability, ease, and cost of installing or retrofitting treatment systems was also analyzed. Table IV-2 lists those plants that retrofitted treatment systems onto older mills. The numerous examples illustrate quite effectively the ability to retrofit treatment systems onto older mills. Cost data received in the D-DCPs for all iron and steel subcategories were tabulated. Those data show that little or no cost is attributable to retrofitting pollution control equipment. This analysis was detailed in Volume I of this development document. Based upon this analysis, the Agency concludes that there are no significant costs associated with retrofitting pollution control technology and that technology can be retrofitted on both newer and older mills with about the same degree of difficulty.

Further analysis of the data did not reveal any relationship between age and wastewater characteristics or treatability. Older mills discharge the same kinds and amounts of pollutants as newer mills and the discharges from both older and newer mills can be treated equally. This also holds true for the larger versus the smaller mills. Some of the largest mills have installed the best recirculation systems and achieve some of the lowest discharge flows on a gallon/ton basis. Wastewaters from larger mills can be treated as effectively as those from smaller mills.

Thus, based upon the analysis conducted above, the Agency concludes that age and size do not affect the ability to achieve the proposed limitations and standards and the ability to install appropriate pollution control technology and, thus, are not bases for segmentation.

Geographic Location

Examination of the raw waste characteristics, process water application rates, discharge rates, effluent quality and pertinent factors associated with plant location reveals no general relationship or pattern. Cold rolling mills are located in fourteen states, but over half of the total number are situated in the major steel producing areas of Pennsylvania and Ohio. Only seventeen are found west of the Mississippi River (14 in Missouri and 3 in California). No significant differences between geographic areas were noted when the data for all plants were reviewed.

The Agency also examined in relation to geographic location, the remand issue dealing with consumptive use of water in "arid" and "semi-arid" regions of the country. However, since cooling towers are not components of the model treatment systems for cold rolling operations, there is no consumptive use of water which will result from compliance with the proposed limitations and standards. Therefore, the remand issue relating to water consumption is not pertinent to this subdivision.

Process Water Usage

This factor, more than any other, affects the subcategorization of cold rolling operations. The applied and discharge flow rates differ significantly depending on the type of oil application system used at the mills.

Flow rates for the different type mills are shown in Table IV-3. As can be seen, both the applied and discharge flow rates differ significantly. This relationship requires the cold rolling subdivision of the cold forming subcategory to be segmented as follows:

Recirculation Mills
Combination Mills
Direct Application Mills

Although the wastewater characteristics are fairly similar for all mills, the Agency concluded that different effluent limitations are appropriate due to the wide variance in flow rates. This relationship is reviewed in more detail in later sections.

TABLE IV-1

AFFECT OF MILL CONFIGURATION ON THE DISCHARGE FLOW RATE COLD ROLLING

Type of Mill	Total No. of Operations Reporting Flows	No. of Operations Achieving the Proposed Flow Rate (1)	Percent
1. Recirculation			
1 - Stand	14	13	93
3 - Stand	6	3	50
4 - Stand	8	4	50
5 - Stand	9	8	89
2. Combination			
2 - Stand	2	1	50
4 - Stand	4	3	75
5 - Stand	6	3	50
6 - Stand	1	0	0
3. Direct Application			
1 - Stand	3	3	100
2 - Stand	2	1	50
3 - Stand	1	0	0
4 - Stand	4	3	75
5 - Stand	3	1	33

---

(1) Proposed BAT flow basis

TABLE IV-2

EXAMPLES OF PLANTS THAT HAVE DEMONSTRATED THE ABILITY TO RETROFIT POLLUTION CONTROL EQUIPMENT
COLD ROLLING

Plant Code	Mill Age (Year)	Treatment Age (Year)
020G	1951	1975
060	1936	1967
060B	1963	1968
060D	1926	1968
122A	1947	1971
112B	1936	1971
176	1921	1963
384A	1938	1948
396D	1938	1959
432A	1947	1970
432B	1937	1966
432C	1957	1964
448A	1952	1969
528	1955	1975
584A	1965	1971
584C	1947	1947 & 1977
584F	1947	1965
684C	1937	1950
684D	1939	1970
684F	1937	1969
760	1950	1971
856D	1938	1959 & 1967
856P	1909	1968
864B	1947	1972
868A	1948	1971
920A	1930	1978
948A	1935	1976
948C	1954	1970

TABLE IV-3

RELATIONSHIP BETWEEN FLOW AND OPERATION TYPE COLD ROLLING

	Applied Process Flow (GPT)	Discharge Flow* (GPT)
Recirculation Mills	2715	9.0
Combination Mills	3930	268
Direct Application Mills	362*	362

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* "Average of the Best" flow (see Section X).

FIGURE IV-1

FLOW VS. SIZE ANALYSIS
COLD ROLLING - RECIRCULATION

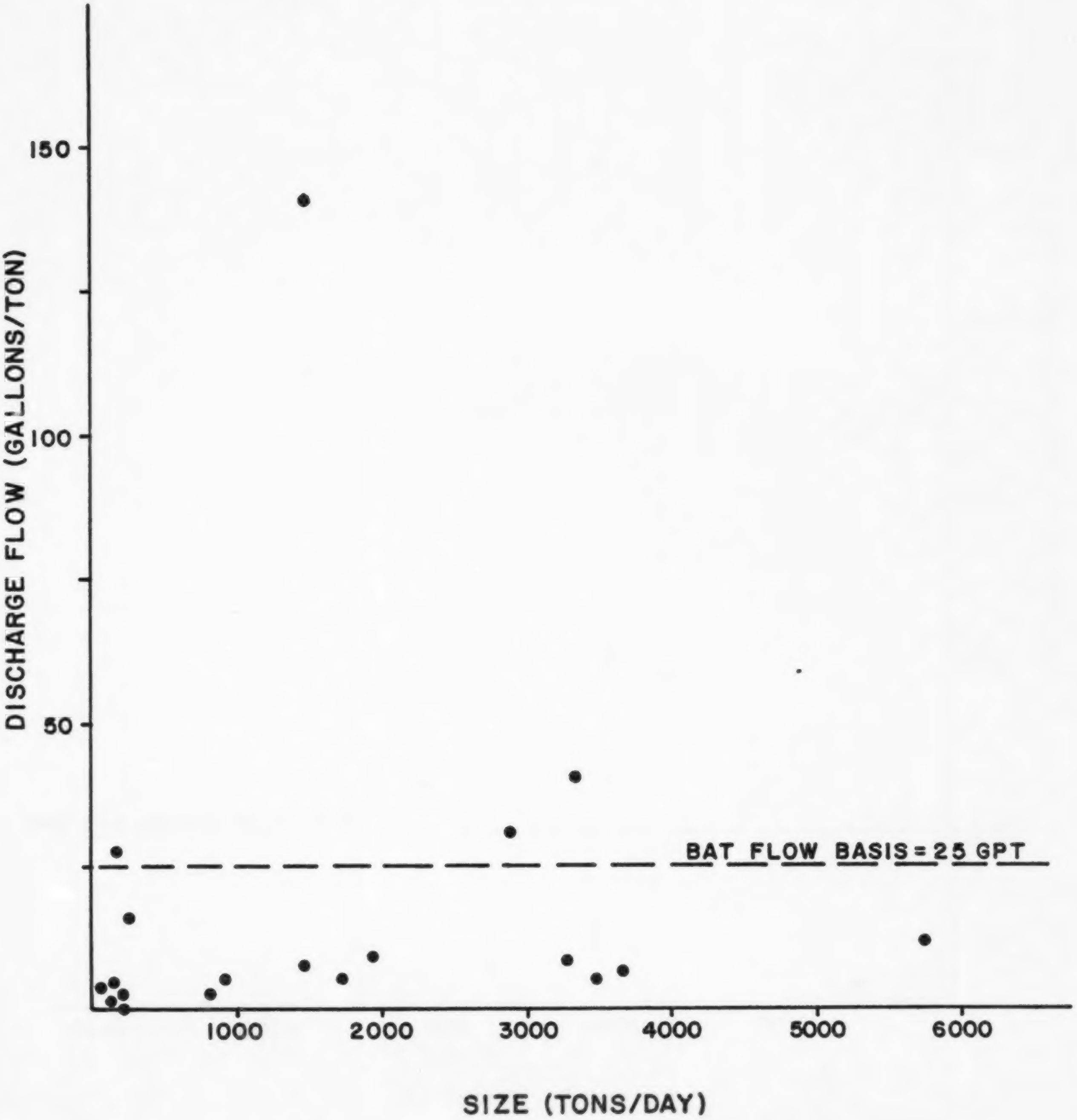


FIGURE IV-2

FLOW vs SIZE ANALYSIS
COLD ROLLING-COMBINATION

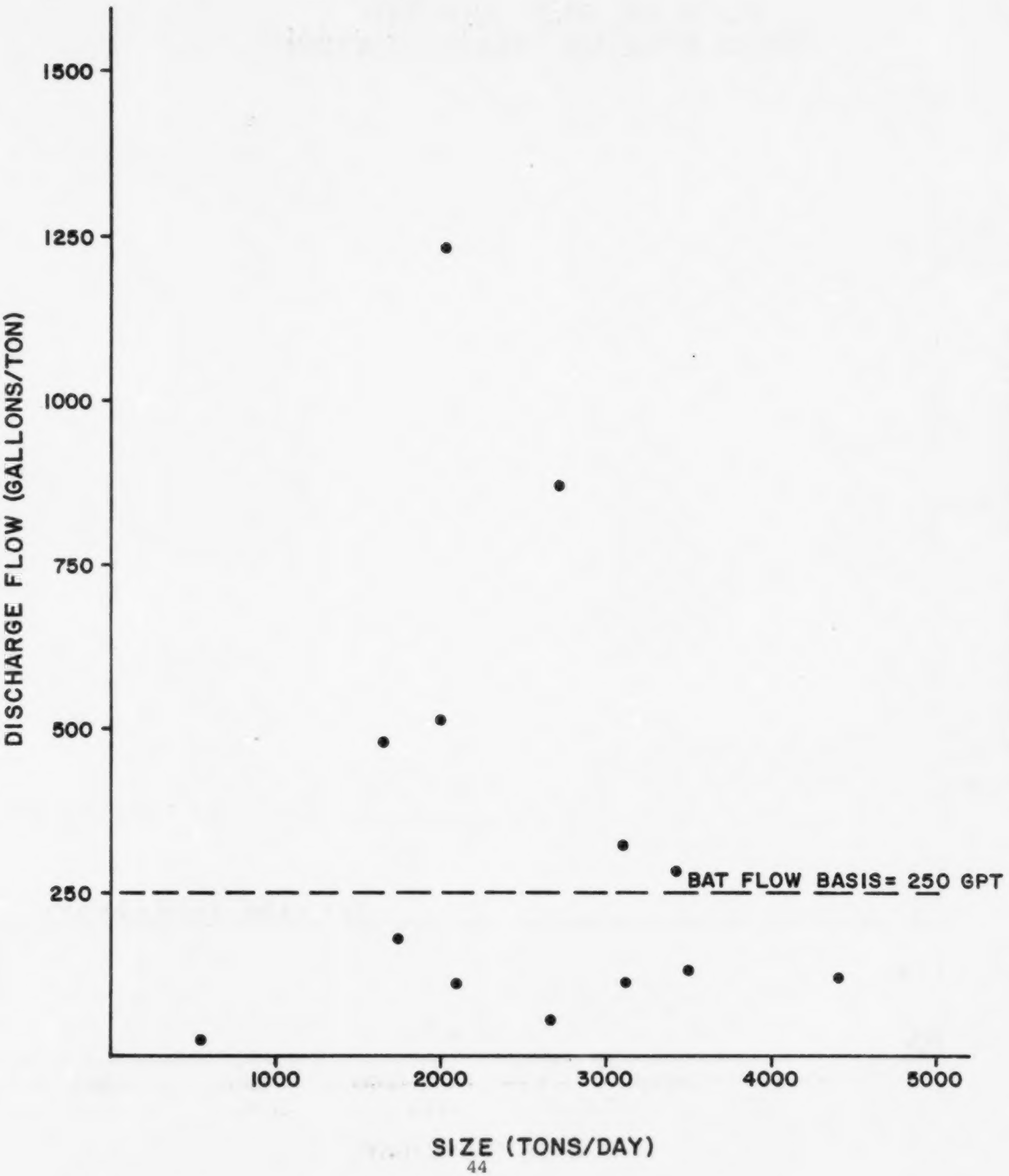


FIGURE IV-3

FLOW VS. SIZE ANALYSIS
COLD ROLLING - DIRECT APPLICATION

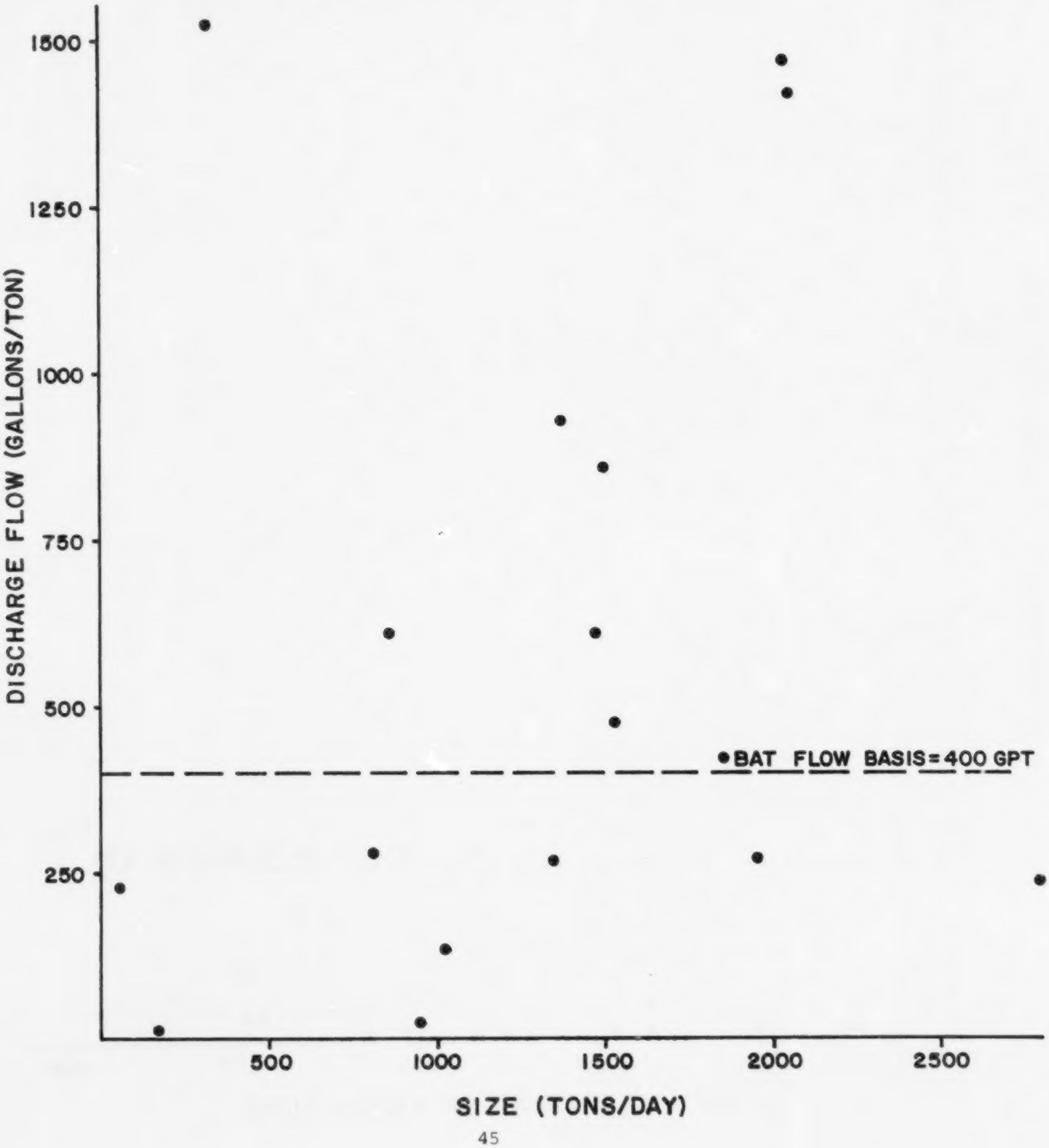


FIGURE IV-4

FLOW VS. AGE ANALYSIS
COLD ROLLING - RECIRCULATION

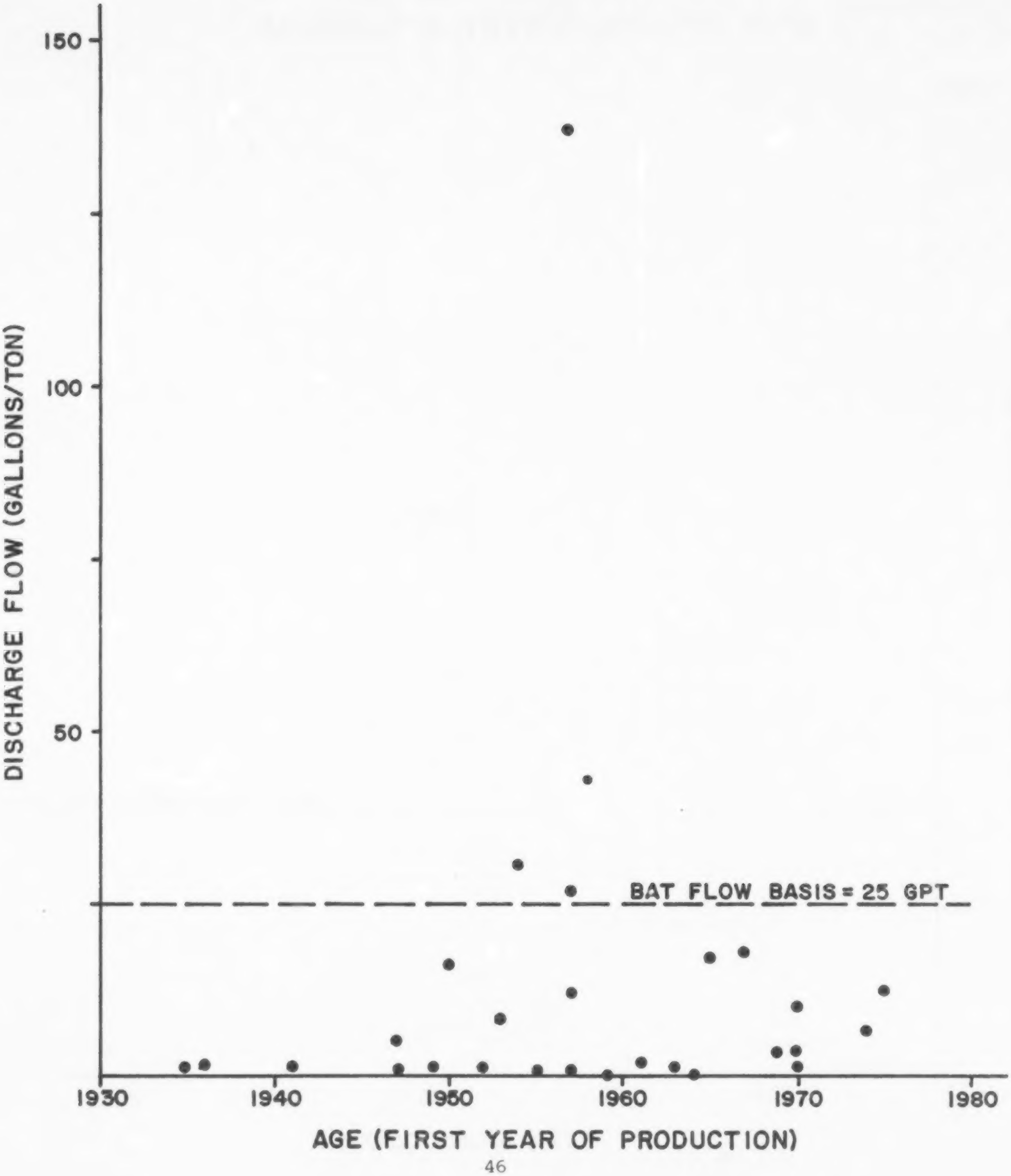


FIGURE IV-5

FLOW VS. AGE ANALYSIS
COLD ROLLING - COMBINATION

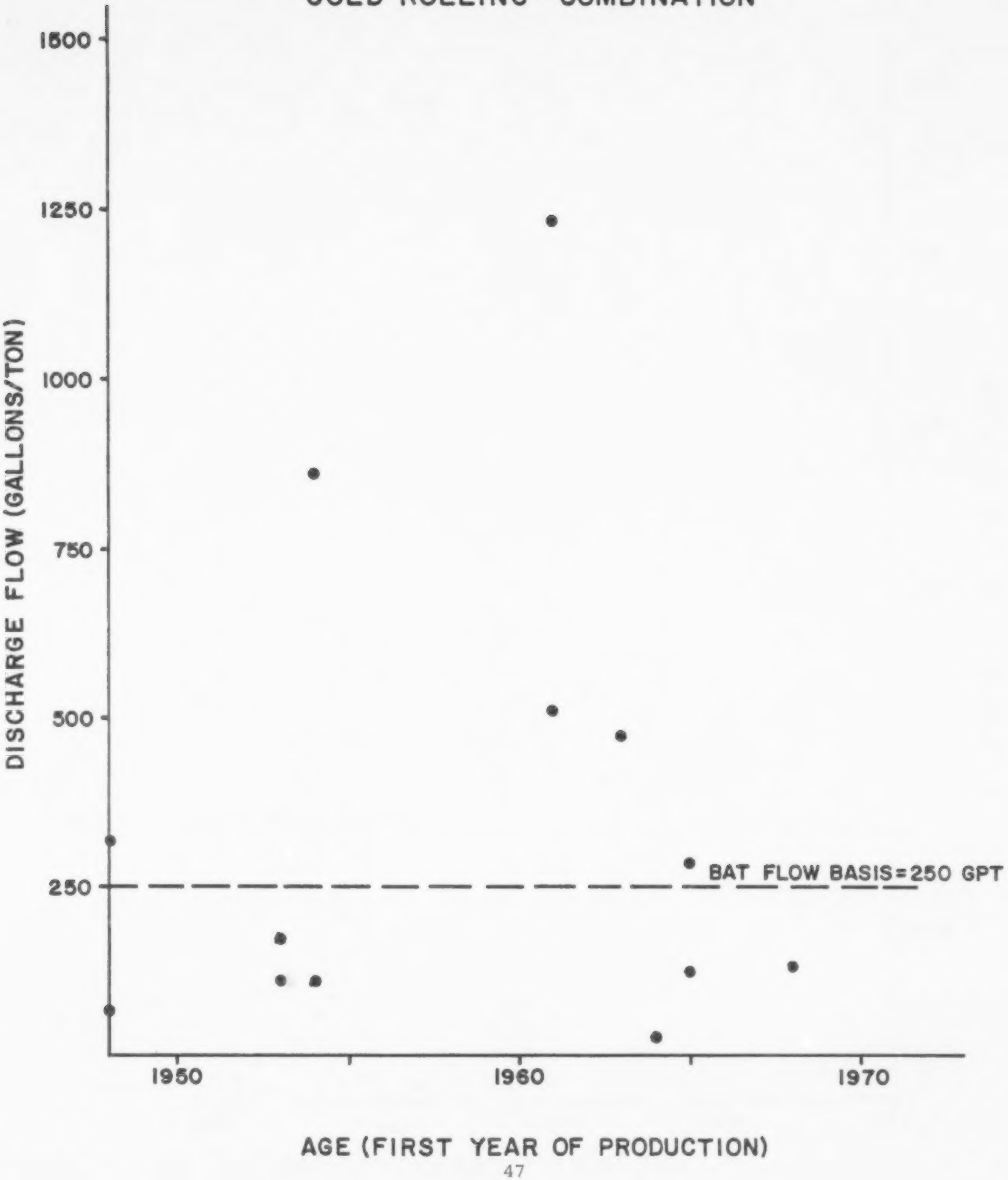
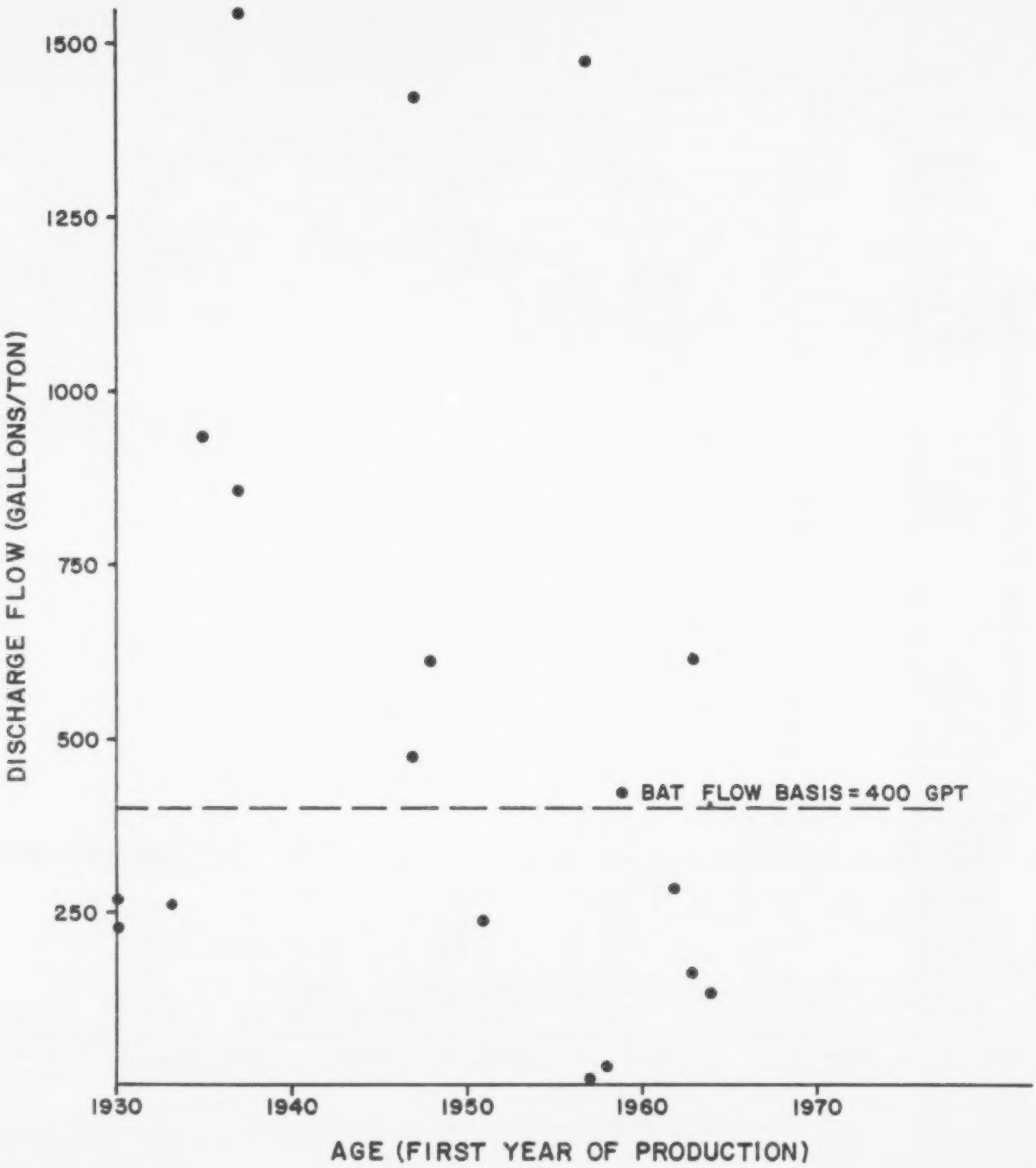


FIGURE IV-6

FLOW VS. AGE ANALYSIS
COLD ROLLING - DIRECT APPLICATION



SECTION V

COLD FORMING SUBCATEGORY

COLD ROLLING

WATER USE AND WASTE CHARACTERIZATION

Introduction

This section presents a characterization of the cold rolling waste streams. The waste characterization is based upon data obtained during field sampling programs at 17 cold rolling operations with two surveys. During the first sampling survey, the Agency investigated the levels of previously limited pollutants. During the second survey, it performed additional monitoring for toxic pollutants. Some mills were visited on more than one occasion during the two sampling phases. In those instances, the more recent data were used to characterize the wastes from that mill, with one exception. Plant 101 was visited twice and significantly different results were found at each visit. For this plant, the results from both visits are included in the data base.

The water use rates discussed below pertain only to process wastewaters, and do not include noncontact cooling or nonprocess waters. Process wastewater is that water which comes into contact with the process, product, by-product, or raw materials, thus becoming contaminated with various pollutants characteristic of the process. Noncontact cooling water is defined as that water used for cooling which does not directly contact processes, products, raw materials, or by-products. Nonprocess water is defined as that water which is used for nonprocess operations (i.e., utilities and maintenance).

Description of the Cold Rolling Operation and Wastewater Sources

The major process water use in cold rolling mills is for cooling the rolls and the material being rolled. This is accomplished by using a flooded lubrication system for both lubrication and cooling. A water-oil emulsion is sprayed directly on the material and rolls. Each stand usually has separate sprays and, where recycle is used, a separate recycle system. Past practice has been the direct sewering of the emulsion. However, the high cost of rolling oils and the implementation of pollution control regulations have modified this practice. Recycle and recovery systems are currently in common use. In fact, most of recently built cold rolling mills use recirculated oil solution systems to minimize oil usage and pollutant loadings.

Considerable heat is generated during heavy reductions at high speed on the various types of mills. Not only is the temperature of the product raised but also the temperature of rolls. This heat is removed from the mill by the flooded lubrication system, and by noncontact water that is used in the internal roll cooling system.

High quality rolling oils are added to form the emulsion sprayed on the rolls. Oil and temperature are the basic pollutants in the discharge. However, the oils become contaminated with solids as they pass over the rolls and the product. Also, the oils themselves can contain high levels of toxic organic pollutants.

Recirculation mills are more common throughout the industry and in the aggregate, roll higher tonnages than do combination and direct application mills. In this operation, the oil emulsion in the flooded lubrication system is collected and recycled to the mill for reapplication to the rolls. Generally, each stand has its own collection tank or sump and pumps to return the emulsion to the sprays. A five stand tandem mill has five recycle systems, one for each stand. With this arrangement it is possible to renew one emulsion tank at a time, or all at once. It is also possible to use different oil emulsions in each tank if the product being rolled so requires. These mills usually have periodic batch discharges of spent rolling emulsions, although a small amount is continuously blown down at some mills to maintain rolling solutions of acceptable quality. The used emulsions in some mills are treated in filters and cooling systems prior to reuse, thereby assuring that the rolling solutions contain few impurities and remain at a fairly uniform temperature. Because of the conservation practices in use and the high degree of recycle, very low wastewater discharge volumes are achieved.

Flow data and net concentrations of pollutants (net over water supply) found at the eleven recirculation operations surveyed for this study are summarized in Tables V-1 and V-2. Net concentrations are presented to best describe the actual levels of pollutants contributed from the cold rolling operation. Averages are also presented to show the typical level of pollutants that can be expected to be found in a discharge from a recirculation cold rolling mill.

The second type of cold rolling mill is the Direct Application (DA) mill. In these mills, fresh rolling solutions are continuously added to the rolls. Treatment plants and palm oil recovery systems are usually installed to reclaim oils for reprocessing and potential reuse. The high cost of rolling oils has discouraged the use of once-through systems. Once-through systems are used only when a high quality product is desired which requires the application of a solution that is free of contamination. These mills have the highest discharge flow rates of any of the cold rolling operations. Flow data and net concentration data for the three DA mills sampled for this study are presented in Table V-5.

The third type of cold rolling mill is the combination mill, which is, as the name implies, a combination of a recirculation and direct application rolling stands. These cold mills are multi-stand with the last stand usually being the direct application stand. Although the applied flow rates are higher than for the other types of mills, the discharge flow rate in gallons/ton for a combination mill is substantially less than for a direct application mill because of the recirculation system. Flow and net concentration data for the three combination mills surveyed are summarized in Tables V-3 and V-4.

Regardless of the type of oil application systems used, miscellaneous oil leaks and spills can occur. Low volume, oil-bearing wastewaters originating in maintenance and roll finishing shops can be significant and should be directed to treatment facilities. Oil and water leaks in oil basements can also contribute high oil loads. These sources of wastewater were considered in developing the proposed limitations.

TABLE V-1

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - RECIRCULATION

Net Concentrations of Pollutants in Raw Wastewaters(1)

	Plant Code	D	I	X-2	BB-2	EE-2	XX-2	
	Reference Code	0248B	0432K	060B-03	060-03	0112D-01	0684I-01	
	Sample Point(s)	3	3	4-7	5-4	1-3	2-1	Average
	Flow (gal/ton)	58	Unk	17.7	16.0	17.5	138	49.4
	Total Suspended Solids	1,170	NA	90	55	637	260	442
	Oil & Grease	3,700	36,000	41,100	664	1,180	619	13,877
	Dissolved Iron	NA	NA	NA	0.05	NA	NA	0.05
	pH	6.8	NA	7.0	8.0	6.9	7.1	6.8-8.0
119	Chromium	0.1	NA	NA	NA	NA	NA	0.1
120	Copper	0.01	NA	NA	NA	NA	NA	0.01
121	Cyanide, Total	*	NA	NA	NA	NA	NA	*
122	Lead	*	NA	NA	NA	NA	NA	*
124	Nickel	0.6	NA	NA	NA	NA	NA	0.6
128	Zinc	0.03	NA	NA	NA	NA	NA	0.03

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(1) All values are in mg/l unless otherwise noted.

* : Value is less than 0.010 mg/l.
NA: Not analyzed.

TABLE V-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION

Net Concentration of Pollutants in Raw Wastewaters(1)

	Plant Code Reference Code Sample Point(s) Flow (gal/ton)	101A 020B&020C B-A 4.5	101B 020B&020C B-A 11.0	103 0384A(02&03) E-A 49	104 0248B-03 B-A 3.5	105 584F(02,03,&05) E-A 1.1	107 176-08 B-A 0.9	Average 14.7	Overall(2) Average 28.9
	Total Suspended Solids	2,220	194	536	1,402	4,910	528	1,632	1,091
	Oil & Grease	82,205	2,499	1,076	(3)	37,200	36,000	31,796	22,022
	Dissolved Iron	33.6	NA	4.6	NA	5.6	NA	14.6	11.0
	pH	6.5	2.4-4.9	6.7	6.8-7.9	5.8	7.5	2.4-7.9	2.4-8.0
004	Benzene	-	*	-	ND	0.03	ND	*	*
006	Carbon Tetrachloride	0.1	ND	ND	ND	ND	ND	0.02	0.02
011	1,1,1-Trichloroethane	0.4	0.09	0.02	0.04	ND	ND	0.1	0.1
013	1,1-Dichloroethane	ND	0.03	ND	ND	ND	*	*	*
023	Chloroform	0.07	*	0.01	-	0.5	ND	0.1	0.1
024	2-Chlorophenol	35.5	ND	0.02	ND	ND	ND	5.9	5.9
034	2,4-Dimethylphenol	25.0	ND	0.06	ND	ND	ND	4.2	4.2
038	Ethylbenzene	0.4	ND	*	*	ND	*	0.07	0.07
044	Methylene Chloride	-	ND	-	0.01	NR	*	*	*
055	Naphthalene	ND	0.5	-	ND	ND	ND	0.08	0.08
057	2-Nitrophenol	70.0	ND	0.06	ND	ND	ND	11.7	11.7
059	2,4-Dinitrophenol	ND	ND	0.02	ND	ND	ND	*	*
060	4,6-Dinitro-o-cresol	-	ND	0.9	ND	ND	ND	0.2	0.2
064	Pentachlorophenol	ND	ND	0.04	ND	ND	*	*	*
065	Phenol	ND	0.09	0.07	-	-	ND	0.03	0.03
066	Bis(2-ethylhexyl) phthalate	0.2	-	0.8	0.08	0	ND	0.2	0.2
068	Di-n-butyl phthalate	0.04	-	0.05	-	-	ND	0.02	0.02
069	Di-n-octyl phthalate	0.1	-	0.05	-	ND	ND	0.03	0.03

Data continued on next page

TABLE V-2
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION
PAGE 2

Plant Code		101A	101B	103	104	105	107		
Reference Code		020B&020C	020B&020C	0384A(02&03)	0248B-03	584F(02,03,&05)	176-08		Overall(2)
Sample Point(s)		B-A	B-A	E-A	B-A	E-A	B-A	Average	Average
Flow (gal/ton)		4.5	11.0	49	3.5	1.1	0.9	14.7	28.9
070	Diethyl phthalate	*	ND	0.02	-	ND	ND	*	*
071	Dimethyl phthalate	0.1	ND	0.1	ND	ND	ND	0.04	0.04
078	Anthracene	ND	ND	ND	ND	ND	14.0	2.3	2.3
080	Fluorene	0	0.2	0.02	ND	ND	ND	0.03	0.03
085	Tetrachloro-ethylene	1.2	0.06	*	ND	ND	ND	0.3	0.3
086	Toluene	0.1	0.02	ND	0.04	0.06	ND	0.04	0.04
087	Trichloro-ethylene	0.02	0.1	-	0.03	-	ND	0.03	0.03
114	Antimony	0.1	*	0	*	0.1	0	0.04	0.04
115	Arsenic	NA	0.4	NA	0	0.6	0.03	0.3	0.3
117	Beryllium	NA	*	NA	0	0.01	0	*	*
118	Cadmium	0.03	0.3	0	0.04	0.4	0.02	0.1	0.1
119	Chromium	6.5	1.1	0.03	3.1	-	10.4	3.5	3.0
120	Copper	7.4	3.6	0.7	7.4	2.0	28.4	8.3	7.1
121	Cyanide, Total	0.01	0	0.03	0.03	-	NA	0.01	*
122	Lead	1.5	*	0.2	10.4	2.3	0.6	2.6	2.6
124	Nickel	NA	1.5	0.2	4.5	0.9	11.5	3.7	3.2
126	Silver	0	0	0	0	0.2	0	*	*
128	Zinc	1.7	7.9	0.2	3.7	0.5	9.5	3.9	3.4
130	Xylene	4.3	NA	*	NA	ND	NA	1.4	1.4

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(1) All values are in mg/l unless otherwise noted.
(2) Average of all values on Tables V-1 and V-2.
(3) Sample could not be analyzed. Heavy oil emulsion formed.

* : Value is less than 0.010 mg/l.
- : Calculation yielded a negative value.
NA: Not analyzed
NR: Not reported

TABLE V-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - COMBINATION

Net Concentration of Pollutants in Raw Wastewaters(1)

Plant Code	DD-2	YY-2	
Reference Code	584E-01	432D-01	
Sample Point	1	4	Average
Flow (gal/ton)	512	138	325
Total Suspended Solids	987	260	624
Oil & Grease	1,399	619	1,009
Dissolved Iron	7.8	NA	7.8
pH	5.7	7.1	5.7-7.1

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(1) All values are in mg/l unless otherwise noted.
NA: Not analyzed

TABLE V-4

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT SURVEY
COLD ROLLING - COMBINATION

Net Concentrations of Pollutants in Raw Wastewaters(1)

	Plant Code	103	
	Reference Code	856F-01	
	Sample Points	D-B	Overall Average(2)
	Flow (gal/ton)	112	254
	Total Suspended Solids	699	649
	Oil & Grease	1,558	1,192
	Dissolved Iron	NA	7.8
	pH	6.6	5.7-7.1
66	Bis(2-ethylhexyl) phthalate	0.03	0.03
115	Arsenic	0.16	0.16
119	Chromium	0.03	0.03
120	Copper	0.89	0.89
124	Nickel	0.21	0.21
128	Zinc	0.15	0.15

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(1) All values are in mg/l unless otherwise noted.
(2) Average of all values on Tables V-3 and V-4.
NA: Not analyzed

TABLE V-5

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - DIRECT APPLICATION

Net Concentrations of Pollutants in Raw Wastewaters(1)

	Plant Code	105	106	107	
	Reference Code	584F-04	112B-01&03-06	176-02	
	Sample Points	D-A	B-A	C-A	Average
	Flow (gal/ton)	424	670	233	442
	Total Suspended Solids	160	73	14.3	82.4
	Oil & Grease	1,861	1,600	173	1,211
	Dissolved Iron	22.3	NA	NA	22.3
	pH	7.2	6.5-9.0	6.8-7.7	6.5-9.0
004	Benzene	0.03	ND	ND	0.01
006	Carbon Tetrachloride	0.03	ND	ND	0.01
011	1,1,1-Trichloroethane	0.14	-	ND	0.05
044	Methylene Chloride	2.40	*	ND	0.80
066	Bis(2-ethylhexyl) phthalate	1.50	ND	ND	0.50
068	Di-n-butyl phthalate	1.00	ND	ND	0.33
069	Di-n-octyl phthalate	0.30	ND	ND	0.10
078	Anthracene	ND	ND	0.10	0.03
085	Tetrachloroethylene	0.08	ND	ND	0.03
115	Arsenic	0.03	0.02	ND	0.02
117	Beryllium	*	ND	0.02	0.01
119	Chromium	-	-	0.10	0.03
120	Copper	ND	0.2	0.05	0.08
122	Lead	0.20	ND	0.8	0.33
124	Nickel	ND	ND	0.5	0.20
126	Silver	0.10	ND	ND	0.03
128	Zinc	ND	0.1	0.03	0.04

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(1) All values are in mg/l unless otherwise noted.

* : Value less than 0.010 mg/l.
NA : Not analyzed
ND : Not detected
(-): Negative value. Counted as zero in average calculations.

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION VI

WASTEWATER POLLUTANTS

Introduction

The final selection of pollutants to be limited for the cold rolling subdivision depended upon an analysis of wastewater samples collected in the field. The list of pollutants limited in the originally promulgated limitations was confirmed and augmented with more extensive field sampling data that included an analysis for toxic pollutants. This section describes the pollutants chosen, and the rationale for selecting those pollutants.

Conventional and Nonconventional Pollutants

In the previous regulation, four pollutants were limited: total suspended solids, oil and grease, dissolved iron and pH. Suspended solids, oil and grease and pH were limited at all cold rolling mills, however; dissolved iron was limited only when the cold rolling wastewaters were treated in combination with pickle rinse waters.

Two of these pollutants, oil and grease and suspended solids, are most characteristic of the cold mill wastewaters. Both originate in the oil solutions that are sprayed on the rolling stands. Oils in significant levels (up to 40,000 mg/l) are contained in untreated wastewaters. Suspended solids are also present in cold rolling wastewaters in high levels with concentrations of 1000 mg/l common for many mills. The suspended solids also originate in the oil solutions as the oils pass over the stands and product and pick up small scale particles or soot from the product surface. In recirculation mills, the solid levels are usually higher than for other mills because of the buildup that can occur as the oil solutions are recirculated. Dissolved iron can also be present in cold rolling wastewaters, but effluent limitations for dissolved iron are proposed only for those operations that co-treat pickling and cold rolling wastewaters.

In addition to the three pollutants discussed above, pH was included in the original limitations and is again included in these proposed limitations. Although the pH of raw cold mill wastes are often within the proposed level of 6-9, a limitation is proposed to insure that the pH remains in this range after treatment. Most cold mill treatment systems use acid addition for treatment of the oily wastes, which reduces the pH to the 4-5 range. The pH limit insures that proper neutralization is carried out prior to discharge.

Toxic Pollutants

Table VI-1 is a list of toxic pollutants found to be present in cold mill wastes through EPA surveys or reported by the industry. The net concentration of each pollutant was calculated and those that were found at average concentrations greater than 0.010 mg/l are considered to be characteristic of cold mill wastes. Table VI-2 presents a list of these toxic pollutants. It is important to note that net concentrations were used only to characterize the pollutants generated in the cold mill process. All proposed effluent limitations were developed on a gross basis taking into account the treatability of each pollutant.

Some pollutants were detected at concentrations greater than 0.010 mg/l but are not listed in Table VI-2. The Agency believes the presence of those compounds is not due to the cold rolling operation. Methylene chloride was omitted because this compound is commonly used as a cleaning agent in the laboratory and the Agency attributes its detection to this practice and not to the cold mills sampled. Also, the phthalate compounds are not believed to be characteristic of cold mill wastes. Evidence developed during the sampling programs indicates that their origin was probably related to plasticizers in the tubing used with automatic samplers.

As noted in Table VI-2, many toxic organic and inorganic pollutants were detected in the wastes from cold rolling operations. The major source of these pollutants is the rolling oils used at the mills. The exact nature of these oils are often proprietary in nature so it is difficult to relate any of the pollutants to any one type of oil or brand name. The Agency expected to find more toxic organic pollutants at the recirculated and combination mills because these mills use more synthetic types of oils. This was verified by the data gathered during the sampling visits.

The Agency is proposing effluent limitations and standards for several of the toxic pollutants on Table VI-2 at BAT, NSPS, PSES, and PSNS. The Agency decided not to propose limitations for all toxic pollutants as those which are limited will also serve as "indicator" pollutants. These "indicator" toxic pollutants were selected on the basis that control of these pollutants will result in similar control of those not specifically limited and, to reduce monitoring costs to the industry. The rationale for the selection of limited pollutants is presented in Volume I of this document. Also, a discussion of the selected pollutants is presented in Section X of this report.

TABLE VI-1

TOXIC POLLUTANTS KNOWN TO BE PRESENT COLD ROLLING

4. Benzene
6. Carbon Tetrachloride
11. 1,1,1-Trichloroethane
13. 1,1-Dichloroethane
23. Chloroform
24. Chlorophenol
34. 2,4-Dimethylphenol
38. Ethylbenzene
44. Methylene Chloride
57. 2-Nitrophenol
59. 2,4-Dinitrophenol
60. 4,6-Dinitro-o-cresol
64. Pentachlorophenol
65. Phenol
66. Bis(2-ethylhexyl) phthalate
67. Butyl benzyl phthalate
68. Di-n-octyl phthalate
69. Di-n-octyl phthalate
70. Diethyl phthalate
71. Dimethyl phthalate
78. Anthracene
80. Fluorene
85. Tetrachloroethylene
86. Toluene
87. Trichloroethylene
114. Antimony
115. Arsenic
117. Beryllium
118. Cadmium
119. Chromium
120. Copper
121. Cyanide
122. Lead
124. Nickel
126. Silver
128. Zinc
130. Xylene

TABLE VI-2

SELECTED POLLUTANTS
COLD ROLLING

006	Carbon Tetrachloride
011	1,1,1-Trichloroethane
023	Chloroform
024	2-Chlorophenol
034	2,4-Dimethylphenol
038	Ethylbenzene
055	Naphthalene
057	2-Nitrophenol
060	4,6-Dinitro-o-cresol
065	Phenol
078	Anthracene
080	Fluorene
085	Tetrachloroethylene
086	Toluene
087	Trichloroethylene
114	Antimony
115	Arsenic
118	Cadmium
119	Chromium
120	Copper
121	Cyanide
122	Lead
124	Nickel
128	Zinc
130	Xylene

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

A review of the control and treatment technologies currently in use or available for use in the cold rolling subdivision provided the basis for the selection and development of BPT, BAT, NSPS, PSES, and PSNS alternative treatment systems. The Agency reviewed the DCP responses and plant visit data to identify those treatment components and systems in use at cold rolling operations. Capabilities, either demonstrated in this or in other operations (refer to Volume I), or based upon engineering considerations, were used in evaluating the various treatment technologies. This section presents a summary of the treatment practices currently in use or available for use in the treatment of cold rolling process wastewaters.

This section also presents the raw wastewater and treated effluent analytical data for the plants sampled and the long-term effluent analytical data provided in responses to the D-DCPs. Also included are treatment system descriptions for each of the sampled plants.

Summary of Treatment Practices Currently Employed

Since the type of wastewaters generated in the three types of cold rolling mills are fairly consistent, similar treatment is employed regardless of the oil application system used. For example, one treatment system may treat wastewaters only from recirculation mills while another may treat a combined waste stream from direct application and recirculation mills. Varying degrees of recovery and reuse of oil emulsions is practiced at the different types of cold rolling mills. While this may affect the concentration of pollutants in the discharge, it does not have a significant affect on the treatment components selected. Depending upon the extent of recycle or reuse practiced, the treatment systems may be sized differently.

All treatment systems for cold rolling mills incorporate physical/chemical controls. Also, wastewaters from over 95% of all cold rolling mills are treated in central treatment systems (i.e., other wastewaters are combined with cold rolling wastewaters prior to treatment). As with many other Phase II operations, this often complicates the analysis of the effluent data for the sampled mills (all but two of the sampled mills had central treatment) because the high strength cold mill wastewaters are often diluted in large central treatment systems.

Because of the predominance of central treatment systems, the data for this subcategory and others were analyzed to determine the effect of central treatment systems on the ability to achieve proposed limitations. This analysis found that similar flow rates and effluent levels are achievable with both types of treatment systems. Therefore, the proposed limitations do not differentiate between separate and central treatment. All treatment models shown in this document reflect "stand-alone" systems, which can be integrated into central treatment plants, provided adequate pretreatment is provided, where necessary.

Besides direct discharge mills, there are ten mills that have only limited pretreatment and discharge to locally owned public treatment works. Additionally, wastewaters from many plants are collected and hauled off-site for disposal by contractor. Thirteen recirculation mills have zero discharge of process wastewaters on this basis.

A summary of control and treatment technology currently practiced at cold rolling mills follows:

1. The first level at control of pollutants for recirculation and combination mills is oil solution reuse. While this practice results in a great cost savings, it also results in a significant reduction in the flow and pollutant loads leaving the operation. The average recirculation rate of used rolling solutions for the mills surveyed is 94.4% with the recirculation rates ranging from 58.4% to 100%.

2. A variety of options exist for treatment of the resultant blowdowns, and all are physical/chemical in nature. The various pollutants in the wastewaters from cold rolling operations are usually treated in separate unit operations. These systems are summarized below by pollutant removed.

   a. Oils and Greases

      Oils and greases present in cold rolling wastewaters can either be emulsified or nonemulsified. The characteristics of emulsified oils vary widely depending on the types of oils used in the rolling solutions. Floating or free oils resulting from mechanical lubrication systems are not found in quantities as high as the emulsified oils.

      If all the oils and greases are nonemulsified, as at some of the direct application mills surveyed, simple oil skimming is sufficient to reduce oil levels to an acceptable level. All that is required is a pit or basin of sufficient size to develop a quiescent zone so that the oil has the opportunity to separate and rise to the surface. From there, it can be either skimmed off by a trough or collected with a mechanical skimmer.

      However, if the wastewaters contain emulsified oils, additional chemical treatment is required to separate the oils from solution prior to other treatment steps. Either acid pickling rinsewaters or purchased acid are added to the oily cold rolling wastewaters in a mixing tank at a pH of

4-5 to chemically break the oil emulsion. Once the emulsion is "broken", coagulant or flotation aids such as alum and polyelectrolytes may be added. The wastewaters are then neutralized and passed through an air flotation or similar oil removal system where oils are separated from the wastewater. Another alternative used for oil removal is sedimentation and skimming after emulsion breaking.

b. Total Suspended Solids

Moderate levels of suspended solids are generated in cold rolling operations. These solids are picked up on the rolls and carried from the process in the oil-water emulsions. Suspended solids removal, in most cases, is carried out in clarifiers or in lagoons after the addition of lime and polymer in mixing tanks. These chemicals promote settling and neutralize the wastewaters. Also, suspended solids are removed by the oil removal systems as some solids cling to the oil particles and are removed by the skimmers and air flotation devices.

An alternative method used at a small number of mills to reduce solids and oil is ultra-high rate (UHR) filtration. Primary settling and skimming is done prior to filtration to reduce the levels of floating oils and heavy solids. Polyelectrolyte addition prior to the filter is sometimes used to improve filter effluent quality and also to facilitate filter backwashing. Clogging of the filter is eliminated by adding steam to the backwash cycle in addition to air and water. The UHR filter is highly effective in reducing solids and oils and can be installed in much smaller areas than conventional settling basins.

c. Dissolved Iron

For most operations that jointly treat acid pickling and cold mill wastewaters, control of dissolved iron is accomplished by the chemical addition, aeration, and clarification described above. To achieve optimum removal, the iron is converted to the ferric state by aeration and neutralization.

3. Plants which discharge to publicly owned treatment works usually have an intermediate level of treatment. Most practice some primary settling and oil skimming to reduce the load of solids and oils entering the POTW. One plant has an ultrafiltration system for pretreatment.

4. Waste solutions are collected and hauled off-site for a large number of plants with small waste volumes. Surface oil skimming prior to disposal is practiced at some mills for recovery of a portion of the used oil.

Control and Treatment Technologies Considered for Toxic Pollutant Removal

Because toxic inorganic and organic pollutants have been detected above treatability levels in the discharges from cold rolling operations, the Agency considered advanced levels of treatment for BAT, NSPS, PSES, and PSNS.

Methods available to effectively reduce the levels of the toxic metal pollutants in cold rolling wastewaters include filtration, chemical precipitation, and others as noted in Volume I.

Twenty toxic organic pollutants were found in the wastewaters from recirculation cold mills at levels up to 35 parts per million (ppm or mg/l). Lesser amounts were found at the direct application mills sampled because of the different oil solutions used at these mills. Because combination mills employ at least one recirculated stand, high levels of toxic organic pollutants are also expected to be found at these operations. For these reasons, limitations for certain organic pollutants are being been proposed for BAT, NSPS, PSES, and PSNS for recirculation and combination mills. The proposed limitations are based upon the application of advanced levels of treatment. However, in most instances, the Agency believes that a change in oil solution can achieve the same limitations.

The advanced treatment alternatives that were considered for cold rolling are listed below. Although only one of these systems has been demonstrated within the cold rolling subdivision, they all have been demonstrated in other industrial applications on wastewaters with characteristics similar to those of cold rolling. The treatment systems actually selected as BAT, NSPS, PSES, and PSNS models are discussed in greater detail in later sections with special emphasis on the applicability to the cold rolling subdivision.

A. Processing of Wastewater With Activated Carbon

Activated carbon has long been used in a variety of applications involving the removal of organic pollutants from wastewater streams. It is also used to remove specific organic contaminants in the wastewaters of various manufacturing operations of the petroleum refining and organic chemical industries. Operational guidelines for the use of activated carbon specify that where treatment of combined wastewaters is involved, or where the water to be processed has significant turbidity, chemical clarification followed by filtration is required. Some industrial applications use chemical precipitation followed by diatomaceous earth filtration to achieve the clarity required for low level removal of organic pollutants. The need for removal of particulates increases where removal of toxic organic pollutants to low levels is required.

Limited data available for carbon adsorption indicate that most of the toxic organic pollutants found in the discharges from cold rolling mills respond well to carbon adsorption. Most can be treated to levels below 50 micrograms per liter. Reference is made to Volume I for additional information on activated carbon adsorption.

B. Removal of Organics With Reverse Osmosis

Reverse osmosis treatment of wastewater is effective for removal of organic compounds that have molecular weights above 200. Below a molecular weight of 200, retention characteristics are variable, depending on steric size of the molecule, degree of hydrogen bonding, and ionization of the molecule. One rough approximation which can be made relative to reverse osmosis is that retention of a compound decreases as molecular weight decreases.

Molecular weights of organic compounds on the toxic pollutants list range from 50 to over 400. Most compounds have molecular weights below 200. Information presented in literature concerning removal of specific compounds indicated poor retention characteristics for low molecular weight compounds of the type that are included on the toxic pollutant list. Based upon this consideration, treatment with reverse osmosis may not be effective for removal of toxic organic pollutants.

C. Ultrafiltration

Ultrafiltration (UF) techniques are based upon a pressure-driven filtration membrane to separate multicomponent solutes, or solutes from solvents, according to molecular size and shape. For this reason, ultrafiltration can be designed quite well to separate the oil emulsion present in many of the discharges from cold rolling operations. At the same time, organic compounds of the correct molecular size that may be found in these emulsions will also be removed. Hence, ultrafiltration could prove to be an effective means to achieve organic toxic pollutant removal of cold rolling wastewaters.

One of the sampled plants, Plant 101, has an ultrafiltration system installed to treat wastewaters from twelve cold mills. The data for this plant (see Table VII-3), show that the ultrafiltration unit is quite effective in reducing the levels of oil and grease and organic matter. However, one potential disadvantage of this system is that the membrane is selective in the types of pollutants it will act on and can clog easily if free oils or similar pollutants are present. This problem was experienced at Plant 101. Wastes from one of the cold mills is now hauled off-site because the ultrafiltration system is unable to effectively treat the wastes from this mill.

Although UF has been demonstrated at Plant 101, this technology has not been used as the basis for the effluent limitations developed for this subcategory. The Agency does not believe that the data available, at this time, on the performance and operation of this system is sufficient to generalize the application of UF for the entire cold rolling subcategory.

D. Processing of Wastewater with Vapor Compression Distillation

Vapor compression brine concentrators are typically used to concentrate high TDS (3,000-10,000 mg/l) to a slurry consistency (approximately 100,000 mg/l). The slurry discharge can be dried in a mechanical drier or allowed to crystallize in a small solar or steam-heated pond prior to final disposal. The distillate quality water generated by this system can be recycled back to the process, thereby eliminating the aqueous discharge from the cold rolling mill. One desirable feature of this system is its relative freedom from scaling. Because of the unique design of the system, calcium sulfate and silicate crystals grow in solution as opposed to depositing on heat transfer surfaces. Economic operation of the system requires a high calcium to sodium ratio (hard water).

Due to cost considerations, only limited application is made of vapor compression distillation in processing wastewater. The need for recovery and reuse of water as may exist in "arid" or "semi-arid" areas is a major consideration in the installation of distillation processing equipment.

Summary of Sampling Visit Data

Recirculation Mills

Thirteen recirculation operations were visited during this study, with one operation sampled twice. The raw and effluent data gathered for the original guidelines study are summarized in Table VII-2. Table VII-3 presents the raw and effluent data from the toxic pollutant survey. Table VII-1 provides a legend for the various control and treatment technology abbreviations used on the above tables and in other tables throughout this report. A brief description of each wastewater treatment system follows. More details are available on the respective wastewater flow diagram.

Plant D - Figure VII-1

Oil skimming is used to remove the insoluble surface oil and chemical addition is used to break the oil emulsion found in the blowdown coolant from the cold rolling operation.

Plant I - Figure VII-2

Oil skimming is used to remove the insoluble surface oil and a paper filter is used to remove particulate matter before recirculating the coolant to the cold rolling operation. The skimmed oil is reprocessed by an outside firm. There is no other discharge from this system.

Plant BB-2 - Figure VII-3

Cold rolling wastes are treated in combination with pickling wastes. Treatment consists of neutralization, aeration, clarification, and lagooning prior to discharge to the receiving stream.

Plant EE-2 - Figure VII-4

Oil skimming, chemical treatment, lagooning, are provided prior to discharge.

Plant X-2 - Figure VII-5

Treatment at this mill consists of air flotation, chemical treatment, clarification, and plant reuse. The cold mill wastes are treated in a central treatment unit together with pickling wastes.

Plant XX-2 - Figure VII-6

Treatment at this mill consists of primary settling, oil skimming, and secondary settling in a lagoon. The cold mill wastes are treated in conjunction with wastes from other operations.

Plant 101 - Figure VII-7

Wastewaters at this plant originate at twelve different cold mill operations. All wastewaters are collected in a holding tank and are treated in an ultrafiltration unit on a batch basis. The effluent from this system is discharged to a POTW. There is no other discharge from this plant.

Plant 102 and FF-2 - Figure VII-8

Plants 102 and FF-2 are the same. Treatment consists of primary sedimentation, mixing, clarification, and sewer discharge. The cold mill wastes are combined with wastes from a hot strip mill prior to the mixing and clarification. Flow and production data shown on Figure VII-8 are from the second visit (102).

Plant 104 - Figure VII-9

This plant has a central wastewater treatment system for several cold rolling mills and other miscellaneous wastes. Treatment consists of addition of an emulsion breaking aid, oil skimming and sedimentation in a settling tank. Wastes from the recirculation mill sampled were not flowing to the treatment system when effluent samples were taken. However, data for the treated effluent are shown and have been used to characterize treatment capabilities of the emulsion breaking and skimming technologies.

Plant 105 - Figure VII-10

This plant has a treatment/oil reclamation system that treats cold mill wastewaters from three recirculated and one direct application mill. Treatment at this mill consists of oil holding tanks, oil skimming and discharge to large lagoons where additional oil and solids removal is provided. The effluent sample at this mill was taken prior to the lagoons.

Plant 107 - Figure VII-11

Only raw waste samples were taken at this operation. A large central treatment system is used at this plant to treat wastes from more than 20 sources.

Combination Mills

Tables VII-4 and 5 present the raw and effluent wasteload data for combination mills. Sampling results are available for three combination mills. Mill DD-2 was sampled twice in 1976; however, only one set of data is provided to avoid duplication. One combination mill was sampled for the toxic pollutant study; the levels found at this visit are listed in Table VII-6.

Plant DD-2 Figure VII-12

Oil skimming, chemical treatment, final settling in a lagoon, are provided prior to discharge.

Plant YY-2 - Figure VII-13

Primary settling, oil skimming, chemical treatment, and final settling in a clarifier are provided. Other wastewaters are combined with the cold mill wastes before central treatment.

Plant 103 - Figure VII-14

Only representative samples of the raw wastewaters at this mill could be obtained at the time of sampling. A large central treatment system is used to treat several waste sources.

Direct Application Mills

Three direct application operations were visited. One operation was sampled twice, once during the original guidelines study and once during the toxic pollutant study. Only the data from the second visit at this operation are used in the data base tables. The raw and treated effluent data for the three operations are presented in Tables VII-6 and 7.

Plant 105 and VV-2 - Figure VII-10

The treatment system and diagram for this mill is the same as described previously for Plant 105 (under recirculation mills).

Plant 106 - Figure VII-15

At this plant, wastewaters from six direct application mills are collected in a sump where floating oils are collected; filtered with twelve upflow sand filters; combined with neutralized pickling and galvanizing wastes; and, settled in a thickener. The discharge from the thickener is then discharged.

Plant 107 - Figure VII-11

See prior discussion on Plant 107.

Summary of Long-Term Analytical Data

Long-term effluent data were obtained for two cold rolling plants. These data are summarized in Table VII-8. Data for the wastewater at Plant 0684F were obtained before it entered final clarification and neutralization. Data for Plant 0920G were provided for the wastewater after chemical treatment and sedimentation.

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. Operating Modes

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. Control Technology

10. DI Deionization

11. SR Spray/Fog Rinse

12. CC Countercurrent Rinse

13. DR Drag-out Recovery

C. Disposal Methods

20. H Haul Off-Site

21. DW Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 3

D. Treatment Technology (cont.)

43.	FLt	Flocculation, where t = type t: L = Lime A = Alum P = Polymer M = Magnetic O = Other, footnote
44.	CY	Cyclone/Centrifuge/Classifier
44a.	DT	Drag Tank
45.	CL	Clarifier
46.	T	Thickener
47.	TP	Tube/Plate Settler
48.	SLn	Settling Lagoon, where n = days of retention time
49.	BL	Bottom Liner
50.	VF	Vacuum Filtration (of e.g., CL, T, or TP underflows)
51.	Ft,m,h	Filtration, where t = type m = media h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52.	CLt	Chlorination, where t = type t: A = Alkaline B = Breakpoint
53.	CO	Chemical Oxidation (other than CLA or CLB)

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 4

D. Treatment Technology (cont.)

54.	BOt	Biological Oxidation, where t = type t: An = Activated Sludge n = No. of Stages T = Trickling Filter B = Biodisc O = Other, footnote
55.	CR	Chemical Reduction (e.g., chromium)
56.	DP	Dephenolizer
57.	ASt	Ammonia Stripping, where t = type t: F = Free L = Lime C = Caustic
58.	APt	Ammonia Product, where t = type t: S = Sulfate N = Nitric Acid A = Anhydrous P = Phosphate H = Hydroxide O = Other, footnote
59.	DSt	Desulfurization, where t = type t: Q = Qualifying N = Nonqualifying
60.	CT	Cooling Tower
61.	AR	Acid Regeneration
62.	AU	Acid Recovery and Reuse
63.	ACt	Activated Carbon, where t = type t: P = Powdered G = Granular
64.	IX	Ion Exchange
65.	RO	Reverse Osmosis
66.	D	Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - RECIRCULATION

Raw Wastewaters

Plant Code	D		I		X-2		BB-2	
Reference Code	248B		432K		060B-03		060-03	
Sample Point	11		3		4		5	
Flow, GPT	57		0.8		17.7		16.0	
	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
Total Suspended Solids	1,740	0.41	NA	NA	90	0.0066	55	0.0037
Oil & Grease	3,700	0.88	36,000	0.12	41,100	3.03	664	0.044
Dissolved Iron	NA	NA	NA	NA	1.2	0.000089	0.05	0.0000033
pH (Units)	6.8		NA		7.0		8.0	
119 Chromium	0.10	0.000024	NA	NA	NA	NA	NA	NA
120 Copper	0.010	0.0000024	NA	NA	NA	NA	NA	NA
124 Nickel	0.62	0.00015	NA	NA	NA	NA	NA	NA
128 Zinc	0.030	0.0000071	NA	NA	NA	NA	NA	NA

Treated Effluents

Plant Code	D		I		X-2		BB-2	
Reference Code	248B		432K		060B-03		060-03	
Sample Point	5		3		5		7	
Flow, GPT	57		0.8		17.7		16.0	
C&TT(1)	Scr,EB,SS,CY		(2)		EB,GF,CL,SS		DN,EB,T,FLP, FP,NL,CL,SL,SS,VF	
	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
Total Suspended Solids	961	0.23	NA (3)		20	0.0015	2.0	0.00013
Oil & Grease	1,049	0.25			4	0.00030	6.0	0.00040
Dissolved Iron	NA	NA			0.10	0.0000073	0.04	0.0000026
pH (Units)	12.0				7.8		7.7	
119 Chromium	NA	NA			NA	NA	NA	NA
120 Copper	0.33	0.000078			NA	NA	NA	NA
124 Nickel	0.050	0.000012			NA	NA	NA	NA
128 Zinc	0.33	0.000078			NA	NA	NA	NA

TABLE VII-2
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES STUDY
COLD ROLLING - RECIRCULATION
PAGE 2

Raw Wastewaters

Plant Code	EE-2		FF-2		XX-2			
Reference Code	112D-01		384A(02&03)		6841-01		Average	
Sample Point	1		1		2			
Flow, GPT	17.4		182		138		61.3	
	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
Total Suspended Solids	637	0.046	194	0.15	260	0.15	495	0.13
Oil & Grease	1,180	0.086	354	0.27	619	0.36	11,930	0.68
Dissolved Iron	1.00	0.000073	0.60	0.00046	NA	NA	0.71	0.00016
pH (Units)	6.8		8.1		7.1		7.3	
119 Chromium	NA	NA	NA	NA	NA	NA	0.10	0.000024
120 Copper	NA	NA	NA	NA	NA	NA	0.010	0.0000024
124 Nickel	NA	NA	NA	NA	NA	NA	0.62	0.00015
128 Zinc	NA	NA	NA	NA	NA	NA	0.030	0.000071

Treated Effluents

Plant Code	EE-2		FF-2		XX-2	
Reference Code	112D-01		384A(02&03)		6841-01	
Sample Point	2		2		5	
Flow, GPT	17.4		182		138	
C&TT(1)	CR, FLP, NL, NW, CL, SL, SS		EB, FLP, CL, SS		NW, PSP, SSP, SS, CNT, BD, SL	
	mg/l	lbs/1000 lbs	mg/l	lb/1000 lbs	mg/l	lb/1000 lbs
Total Suspended Solids	2.0	0.00015	10	0.0076	30	0.017
Oil & Grease	4.0	0.00029	5	0.0038	7	0.0040
Dissolved Iron	0.020	0.0000014	0.030	0.000024	NA	NA
pH (Units)	7.8		8.3		7.3	
119 Chromium	NA	NA	NA	NA	NA	NA
120 Copper	NA	NA	NA	NA	NA	NA
124 Nickel	NA	NA	NA	NA	NA	NA
128 Zinc	NA	NA	NA	NA	NA	NA

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(1) For C&TT abbreviations, see Table VII-1.
(2) Recirculated oil emulsions treated in a filter. The only discharge from this system is waste oil solutions.
(3) Discharge consists of waste oil solutions.

NA: Not analyzed

TABLE VII-3

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS

Raw Wastewaters

	Plant Code	101A		101B		102		104		105		107		Average(3)		Overall(4) Average	
	Reference No.	20B+20C(1)		20B+20C(1)		384A-(02+03)		248B-03		584F-(02,03,+05)		176-08					
	Sample Point	B		B		E		B		E		B					
	Flow, GPT	4.5		11.0		49		3.5		1.1		0.9		11.7		36.5	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
	Total Suspended Solids	2,220	0.042	170	0.0078	556	0.11	1403	0.020	5,040	0.023	530	0.0020	1653	0.034	1,074	0.081
	Oil and Grease	82,210	1.54	2,506	0.11	1,076	0.22	NA(2)	NA(2)	37,200	0.17	36,000	0.14	31,798	0.44	21,864	0.56
	Dissolved Iron	6.5	0.00012	NA	NA	4.8	0.00098	NA	NA	516.5	0.0023	NA	NA	176	0.0011	88.4	0.00063
	pH (Units)	6.5		2.3-4.5		6.7		6.8-7.9		5.8		7.5		2.3-7.9		2.3-7.9	
006	Carbon Tetrachloride	0.11	0.0000020	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.018	**	0.018	**
011	1,1,1-Trichloroethane	0.42	0.0000077	0.10	0.000046	0.019	0.0000040	0.038	**	ND	ND	*	**	0.097	0.0000031	0.097	0.000031
023	Chloroform	0.08	0.0000014	*	**	0.011	0.0000022	ND	ND	0.54	0.0000024	ND	ND	0.11	0.0000012	0.11	0.0000012
024	2-Chlorophenol	35.5	0.00066	ND	ND	0.021	0.0000042	ND	ND	ND	ND	ND	ND	5.92	0.00011	5.92	0.00011
034	2,4-Dimethylphenol	25.0	0.00047	ND	ND	0.060	0.000012	ND	ND	ND	ND	ND	ND	4.18	0.000080	4.18	0.000080
038	Ethylbenzene	0.39	0.0000072	ND	ND	*	0.0000020	*	**	ND	ND	*	**	0.070	0.0000019	0.070	0.0000019
055	Naphthalene	ND	ND	0.54	0.000025	ND	ND	ND	ND	ND	ND	ND	ND	0.090	0.0000042	0.090	0.0000042
057	2-Nitrophenol	70.0	0.0013	ND	ND	0.060	0.000012	ND	ND	ND	ND	ND	ND	11.68	0.00022	11.68	0.00022
060	4,6-Dinitro-o-cresol	ND	ND	ND	ND	0.94	0.00019	ND	ND	ND	ND	ND	ND	0.16	0.000032	0.16	0.00032
065	Phenol	ND	ND	0.090	0.0000041	0.068	0.000014	ND	ND	ND	ND	ND	ND	0.026	0.0000030	0.026	0.0000030
078	Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16.0	0.000060	2.67	0.000010	2.67	0.000010
080	Fluorene	*	**	0.16	0.0000073	0.015	0.0000031	ND	ND	ND	ND	ND	ND	0.031	0.0000019	0.031	0.0000019
085	Tetrachloroethylene	1.15	0.000022	0.062	0.0000028	*	0.0000020	ND	ND	0.48	0.0000021	ND	ND	0.29	0.0000048	0.29	0.0000048
086	Toluene	0.11	0.0000020	0.019	**	ND	ND	0.035	**	0.064	**	*	**	0.040	0.0000010	0.040	0.0000010
087	Trichloroethylene	0.018	**	0.14	0.0000064	ND	ND	0.025	**	ND	ND	ND	ND	0.031	0.0000014	0.031	0.0000014
114	Antimony	0.15	0.0000028	*	**	0.10	0.000020	0.014	**	0.13	**	0.012	**	0.069	0.0000045	0.069	0.0000045
115	Arsenic	NA	NA	0.41	0.000019	NA	NA	*	**	0.58	0.0000026	0.06	**	0.27	0.0000059	0.27	0.0000059
118	Cadmium	0.045	**	0.031	0.000014	*	0.0000020	0.040	**	0.45	0.0000020	0.02	**	0.099	0.0000035	0.099	0.0000035
119	Chromium	6.5	0.00012	1.08	0.000050	0.06	0.000012	3.13	0.000046	0.38	0.000017	10.4	0.000039	3.59	0.000045	1.85	0.000034
120	Copper	7.5	0.00014	3.65	0.00017	0.70	0.00014	7.44	0.00011	2.26	0.000010	28.4	0.00011	8.32	0.00011	4.17	0.000056

Raw wastewater data continued on next page.

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 2

Raw Wastewaters

	Plant Code	101A(1)		101B(1)		102		104		105		107		Average(3)		Overall(4) Average	
	Reference No.	20B+20C		20B+20C		384A-(02+03)		248B-03		584F-(02,03,+05)		176-08					
	Sample Point	B		B		E		B		E		B					
	Flow, GPT	4.5		11.0		49		3.5		1.1		0.9		11.7		36.5	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
122	Lead	1.55	0.000029	0.53	0.000024	0.21	0.000043	10.48	0.00015	2.5	0.000011	0.6	0.0000022	2.65	0.000038	2.65	0.000038
124	Nickel	NA	NA	1.58	0.000072	0.23	0.000047	4.71	0.000069	1.25	0.0000056	11.5	0.000043	3.85	0.000047	2.24	0.000097
128	Zinc	1.75	0.000033	7.95	0.00036	0.18	0.000037	3.74	0.000055	0.68	0.0000030	9.5	0.000036	3.97	0.000087	2.00	0.000079
130	Xylene ●	4.30	0.000080	NA	NA	*	0.0000020	ND	ND	NA	NA	NA	NA	1.44	0.000027	1.44	0.000027

Treated Effluents

	Plant Code	101A(1)		101B(1)		102		104(6)		105		107	
	Reference No.	20B+20C		20B+20C		384A-(02+03)		248B-03		584F-(02,03,+05)		176-08	
	Sample Points	C		B		I		D		NA		NA	
	Flow, GPT	4.5		11.0		49		3.5		1.1		0.9	
	C&TT(5)	Ultrafiltration		Ultrafiltration		PSP,EB,CL		Surge Tank,EB, OB,SB		EB,SS		Not Applicable	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
	Total Suspended Solids	198.5	0.0037	76.5	0.0035	20	0.027	52	0.00076	Samples of the effluent at this plant were not available. Therefore, no effluent data will be presented.		The cold mill at Plant 107 discharges into a large central treatment system. No effluent samples were taken of this treatment system.	
	Oil and Grease	140	0.0026	13.1	0.00060	3.0	0.0075	133	0.0019				
	Dissolved Iron	805	0.015	NA	NA	15.7	0.027	NA	NA				
	pH (Units)	4.1		2.4-4.9		8.2		5.8-6.8					
006	Carbon Tetra-	ND	ND	ND	ND	ND	ND	ND	ND				
011	1,1,1-Trichloroethane	*	**	0.056	0.0000026	ND	ND	*	**				
023	Chloroform	0.043	**	*	**	0.024	0.0000049	*	**				
024	2-Chlorophenol	ND	ND	ND	ND	ND	ND	ND	ND				
034	2,4-Dimethylphenol	ND	ND	*	**	*	0.0000020	0.021	**				
038	Ethylbenzene	0.010	**	ND	ND	ND	ND	0.015	**				
055	Naphthalene	0.034	**	0.10	0.0000046	ND	ND	0.010	**				
057	2-Nitrophenol	0.021	**	ND	ND	ND	ND	ND	ND				
060	4,6-Dinitro-o-cresol	ND	ND	ND	ND	*	0.0000020	ND	ND				
065	Phenol	0.055	0.0000010	0.50	0.000023	*	0.0000020	0.14	0.0000020				
078	Anthracene	ND	ND	*	**	0.010	0.0000020	ND	ND				
080	Fluorene	*	**	0.033	0.0000015	*	0.0000020	ND	ND				

Treated effluent data continued on next page.

TABLE VII-3
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - RECIRCULATION MILLS
PAGE 3

Treated Effluents

Plant Code		101A		101B		102		104		105		107	
C&TT		Ultrafiltration		Ultrafiltration		PSP,EB,CL		OB,SB		EB,SS		Not Applicable	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
085	Tetrachloro-ethylene	0.016	**	0.033	0.0000015	ND	ND	ND	ND	See note above		See note above	
086	Toluene	0.060	0.0000011	0.10	0.0000046	ND	ND	*	**				
087	Trichloro-ethylene	ND	ND	0.064	0.0000029	*	0.0000020	0.013	**				
114	Antimony	0.30	0.0000056	*	**	0.10	0.000020	*	**				
115	Arsenic	NA	NA	0.36	0.000017	NA	NA	*	**				
118	Cadmium	0.020	**	0.029	0.0000013	NA	NA	*	**				
119	Chromium	1.17	0.000022	0.81	0.000037	0.010	0.0000020	0.19	0.0000028				
120	Copper	0.065	0.0000012	1.85	0.000085	0.030	0.0000061	0.41	0.0000060				
122	Lead	0.09	0.0000017	0.50	0.000023	0.020	0.0000041	0.11	0.0000016				
124	Nickel	NA	NA	1.41	0.000065	0.050	0.000010	0.31	0.0000045				
128	Zinc	5.25	0.000099	7.46	0.00034	0.025	0.0000051	0.32	0.0000047				
130	Xylene	*	**	NA	NA	ND	ND	NA	NA				

---

(1) Twelve cold rolling mills discharge to a joint treatment system. The designation of these mills is as follows: 20B-01, 20B-02, 20B-04, 20B-05, 20C-(01-08).
(2) Sample could not be analyzed, heavy oil emulsion formed.
(3) Values reported as ND are included in the average value as zero. Values reported as NA are not included.
(4) Average of all values on Tables VII-2 and VII-3.
(5) For C&TT abbreviations, see Table VII-1.
(6) Treated effluent samples were taken when no wastes from the recirculation mill of concern were entering the treatment system. Therefore, this data will not be used for limitation justification.
* : Detected at a value less than 0.010 mg/l.
**: Value less than 0.000001 lbs/1000 lbs.
NA: Not analyzed.
ND: Not detected.

TABLE VII-4

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES SURVEY
COLD ROLLING - COMBINATION

Raw Wastewater

Plant Code	DD-2		YY-2			
Reference Code	584E-01		432D-01			
Sample Point	1		4		Average	
Flow, gal/ton	512		138		325	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Total Suspended Solids	987	2.11	260	0.15	624	1.13
Oil & Grease	1,399	2.99	619	0.36	1,009	1.67
Dissolved Iron	7.8	0.017	NA	NA	7.8	0.017
pH	5.7		7.1		5.7-7.1	

Treated Effluents

Plant Code	DD-2		YY-2	
Reference Code	584E-01		432D-01	
Sample Points	2		5	
Flow, gal/ton	512		138	
C&TT	Chem. Treat. & Lagoons		Chem. Treat. & Lagoons	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Total Suspended Solids	6	0.013	16	0.0092
Oil & Grease	4	0.085	6	0.0035
Dissolved Iron	0.04	0.000085	NA	NA
pH	7.7		8.2	

NA: Not analyzed

TABLE VII-5

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - COMBINATION

Raw Wastewater

	Plant Code	103			
	Reference Code	0856F-01		Overall Average[1]	
	Sample Point	D			
	Flow, gal/ton	112		254	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Total Suspended Solids	NA	NA	624	1.13
	Oil & Grease	1563	0.73	1194	1.36
	Dissolved Iron	NA	NA	7.8	0.0167
	pH	6.6		5.7-7.8	
115	Arsenic	0.16	0.000075	0.16	0.000075
119	Chromium	0.03	0.000014	0.03	0.000014
120	Copper	0.89	0.00042	0.89	0.00042
124	Nickel	0.21	0.000098	0.21	0.000098
128	Zinc	0.15	0.000070	0.15	0.000070

Treated Effluent

Because of the difficulty in obtaining treated effluent samples at the central treatment system at this plant, no samples were taken during the plant visit.

---

(1) Average of all values on Tables VII-5 and VII-6.
NA: Not analyzed

TABLE VII-6

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ORIGINAL GUIDELINES SURVEY
COLD ROLLING - DIRECT APPLICATION

Raw Wastewater

Plant Code		VV-2	
Reference Code		584F-04	
Sample Point		1	
Flow, gal/ton		1,200	
	mg/l		lbs/1000 lbs
Total Suspended Solids	43		0.22
Oil & Grease	468		2.34
Dissolved Iron	NA		NA
pH		6.0	

Treated Effluents

Plant Code		VV-2	
Reference No.		584F-04	
Sample Point		3	
Flow, gal/ton		1,200	
C&TT Codes		SS,SL	
	mg/l		lbs/1000 lbs
Total Suspended Solids	36		0.18
Oil & Grease	9		0.045
Dissolved Iron	NA		NA
pH		7.1	

NA: Not applicable

TABLE VII-7

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - DIRECT APPLICATION

Raw Wastewater

	Plant Code	105		106		107				Overall Average(1)	
	Reference Code	584F-04		112B-01603-06		176-02		Average			
	Sample Point	D		B		C					
	Flow, gal/ton	424		670		233		442		632	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
	Total Suspended Solids	290	0.51	99	0.28	15	0.015	135	0.27	112	0.26
	Oil & Grease	1.861	3.29	1605	4.48	178	0.17	1215	2.65	1028	2.57
	Dissolved Iron	23.3	0.041	NA	NA	NA	NA	23.3	0.041	23.3	0.041
	pH	7.2		6.5-9.0		6.7-7.7		6.5-9.0		6.0-9.0	
4	Benzene	*	**	ND	ND	ND	ND	*	**	*	**
6	Carbon Tetrachloride	0.03	0.000058	ND	ND	ND	ND	0.01	0.000019	0.01	0.000019
11	1,1,1-Trichloroethane	0.14	0.00025	*	0.000028	ND	ND	0.05	0.000093	0.05	0.000093
78	Anthracene	ND	ND	*	0.000028	0.10	0.000098	0.03	0.000042	0.03	0.000042
85	Tetrachloroethylene	0.08	0.00015	ND	ND	ND	ND	0.03	0.000050	0.03	0.000050
115	Arsenic	0.03	0.000053	0.02	0.000056	ND	ND	0.02	0.000036	0.02	0.000036
117	Beryllium	*	**	*	0.000028	0.02	0.000019	0.01	0.000019	0.01	0.000019
119	Chromium	0.17	0.00030	*	0.000028	0.10	0.000098	0.10	0.00014	0.10	0.00014
120	Copper	0.24	0.00042	0.2	0.00056	0.05	0.000049	0.16	0.00034	0.16	0.00034
122	Lead	0.42	0.00074	*	0.000028	0.80	0.00078	0.41	0.00052	*	0.000028
124	Nickel	0.35	0.00062	0.05	0.00014	0.50	0.00049	0.30	0.00042	0.30	0.00042
128	Zinc	0.20	0.00035	0.2	0.00056	0.03	0.000029	0.14	0.00031	0.14	0.00031

TABLE VII-7
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
TOXIC POLLUTANT STUDY
COLD ROLLING - DIRECT APPLICATION
PAGE 2

Treated Effluent

	Plant Code	105		106		107	
	Refererence Code	584F-04(2)		112B-01&03-06(3)		176-02	
	Sample Point	F		(C/C+D)E		NA	
	Flow, gal/ton	424		670		233	
	C&TT Codes	NA,EB,SS		E,SS,FSP,NW,T		Central Treatment	
		mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs	mg/l	lbs/ 1000 lbs
	Total Suspended Solids	295	0.52	28	0.00039	No treated effluent samples taken at this plant.	
	Oil & Grease	1,351	2.39	15	0.0027		
	Dissolved Iron	167	0.30	NA	NA		
	pH	3.3		Unk			
4	Benzene	*	**	*	**		
6	Carbon Tetrachloride	0.04	0.000076	ND	ND		
11	1,1,1-Trichloroethane	0.2	0.00034	*	0.000029		
78	Anthracene	ND	ND	*	0.000016		
85	Tetrachloroethylene	0.07	0.00013	*	0.000049		
115	Arsenic	0.03	0.000055	*	**		
117	Beryllium	0.02	0.000035	*	0.000029		
119	Chromium	0.24	0.00042	*	**		
120	Copper	0.45	0.00080	0.018	**		
122	Lead	0.60	0.0011	0.05	**		
124	Nickel	0.50	0.00088	0.05	**		
128	Zinc	0.68	0.0012	1.6	**		

---

* : Value less than 0.010 mg/l
**: lbs/1000 lbs values less than 0.000010
(1) Average of all values on Tables VII-8 and VII-9.
(2) Discharge goes to lagoons for further treatment.
(3) lbs/1000 lbs vales calculated. The values shown can not be derived from concentrations and flow value shown.

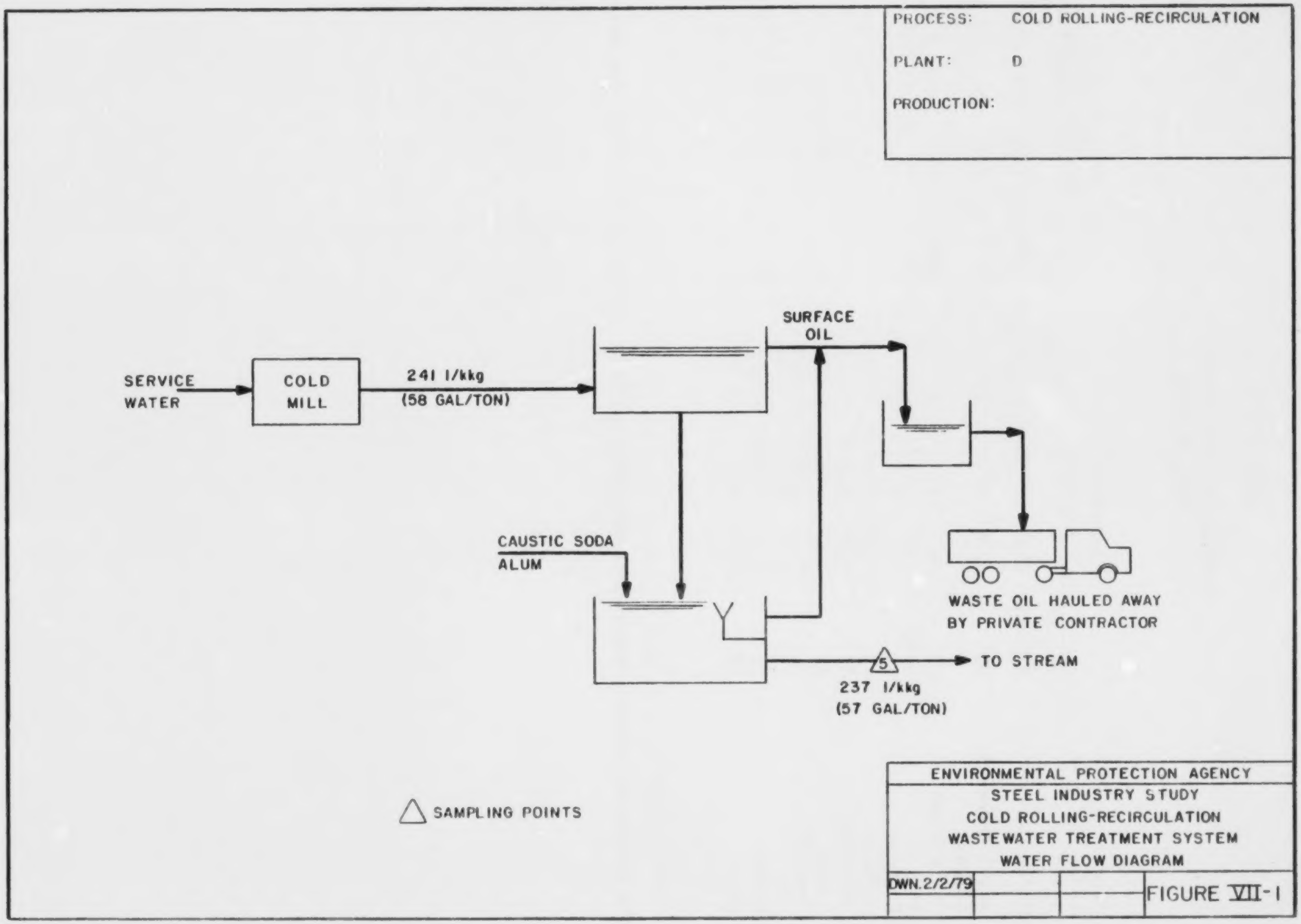
TABLE VII-8

SUMMARY OF LONG-TERM DATA
COLD ROLLING

Plant Code		0684F-03(1)				0920G-(01&02)			
C&TT Codes		EB,GF,SS				EB,GF,CL,SS,CNT			
Parameters		No. of Samples	High	Mean	Stand. Deviation	No. of Samples	High	Mean	Stand. Deviation
	Total Suspended Solids	80	1,363	113	188	195	81.0	25.0	13.3
	Oil & Grease	79	147	17.7	22.0	268	66.0	19.2	9.6
	pH	1,206	13.6	10.0	0.9	58	2.7 to 8.0		
	Phenols	7	1.4	0.4	0.5	0	-	-	-
118	Cadmium	11	0.012	0.0069	0.0039	0	-	-	-
119	Chromium	11	0.13	0.044	0.037	0	-	-	-
120	Copper	11	0.13	0.071	0.037	0	-	-	-
121	Cyanide	7	0.063	0.029	0.020	0	-	-	-
122	Lead	11	1.16	0.059	0.039	0	-	-	-
124	Nickel	11	0.08	0.054	0.022	0	-	-	-
128	Zinc	78	80.0	4.6	10.6	0	-	-	-

---

(1) The discharge receives additional treatment prior to discharge to a receiving stream.



PROCESS: COLD ROLLING-RECIRCULATION

PLANT: D

PRODUCTION:

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

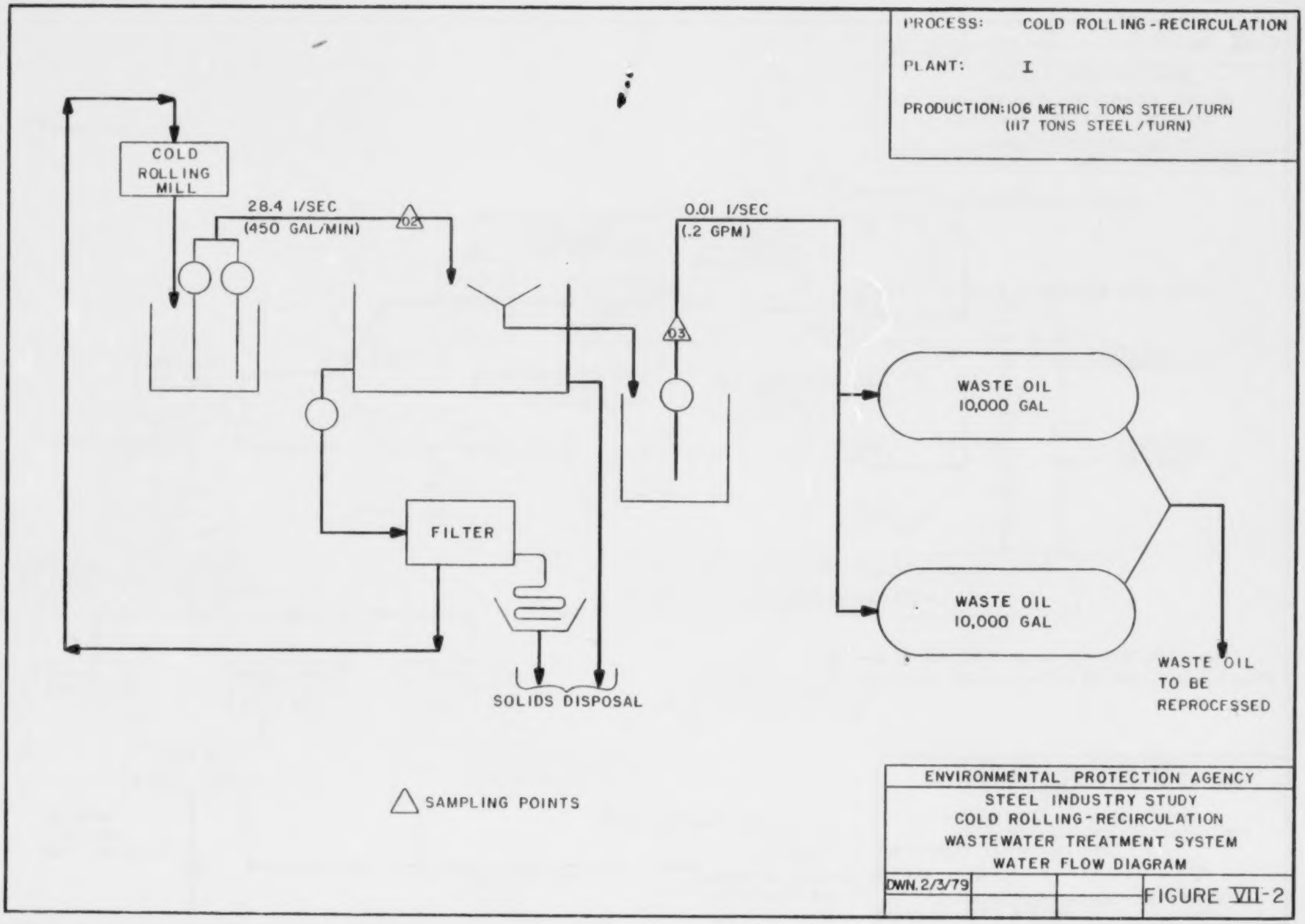
DWN.2/2/79

FIGURE VII-1

PROCESS: COLD ROLLING-RECIRCULATION

PLANT: I

PRODUCTION: 106 METRIC TONS STEEL/TURN
(117 TONS STEEL/TURN)

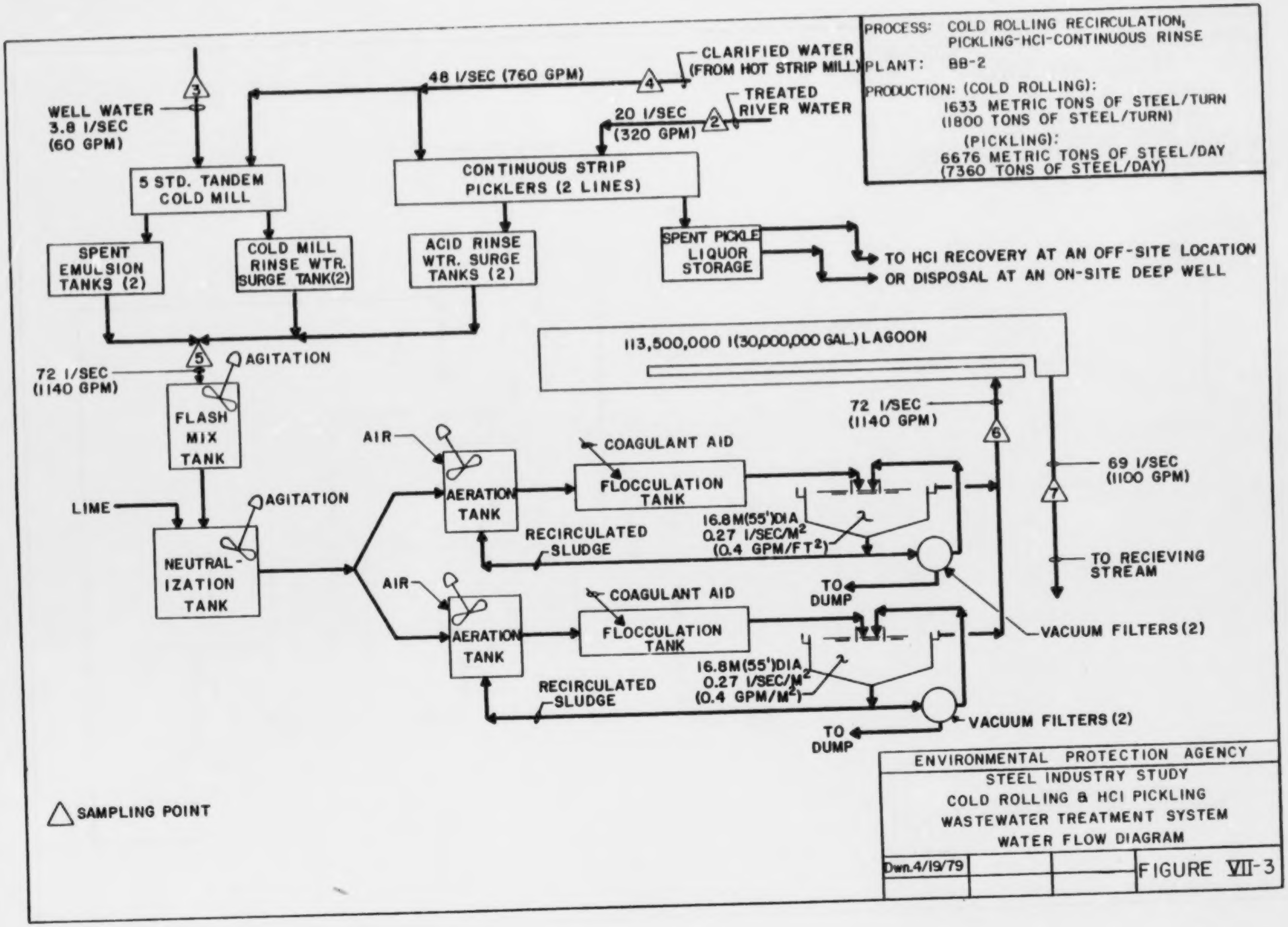


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN. 2/3/79

FIGURE VII-2



PROCESS: COLD ROLLING RECIRCULATION, PICKLING-HCl-CONTINUOUS RINSE
PLANT: BB-2
PRODUCTION: (COLD ROLLING):
1633 METRIC TONS OF STEEL/TURN
(1800 TONS OF STEEL/TURN)
(PICKLING):
6676 METRIC TONS OF STEEL/DAY
(7360 TONS OF STEEL/DAY)

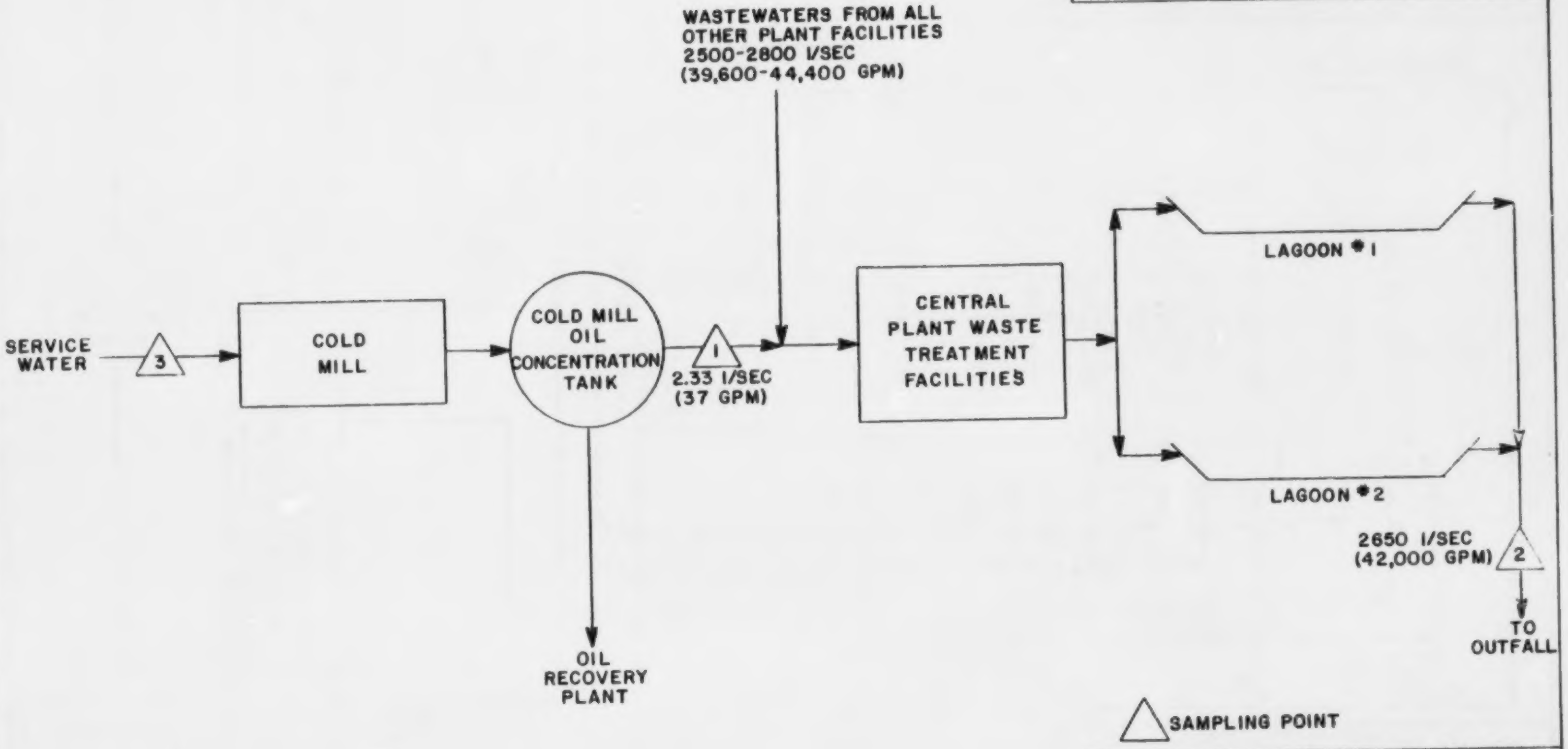
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING & HCl PICKLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-3

PROCESS: COLD ROLLING-RECIRCULATION

PLANT: EE-2

PRODUCTION: 935 METRIC TONS STEEL/TURN
(1030 TONS STEEL/TURN)

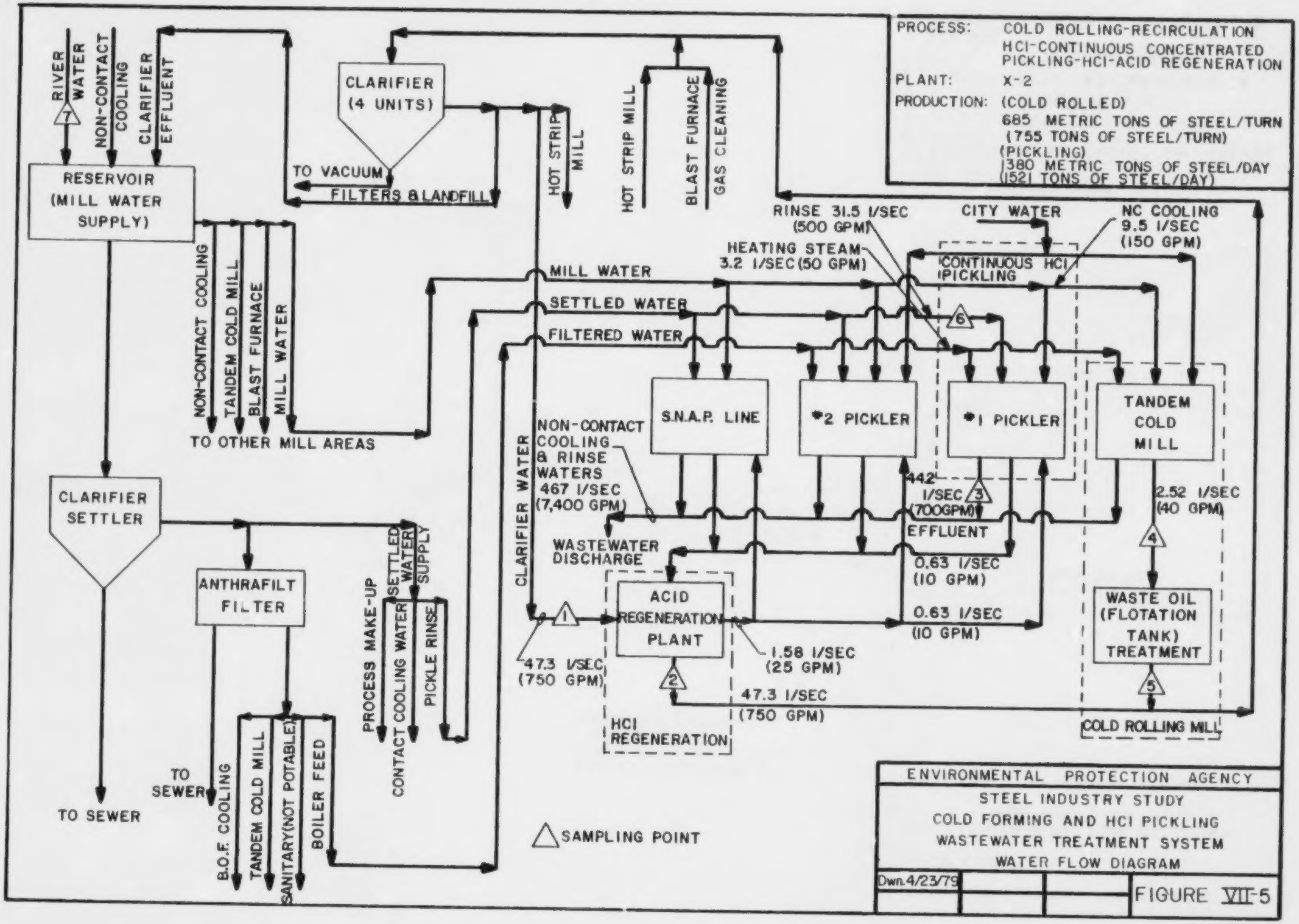

WASTEWATERS FROM ALL OTHER PLANT FACILITIES 2500-2800 l/SEC (39,600-44,400 GPM)
SERVICE WATER
3
COLD MILL
COLD MILL OIL CONCENTRATION TANK
1
2.33 l/SEC (37 GPM)
CENTRAL PLANT WASTE TREATMENT FACILITIES
LAGOON #1
LAGOON #2
2650 l/SEC (42,000 GPM)
2
TO OUTFALL
OIL RECOVERY PLANT
SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg. 6/6/75
Rev. 2/20/76

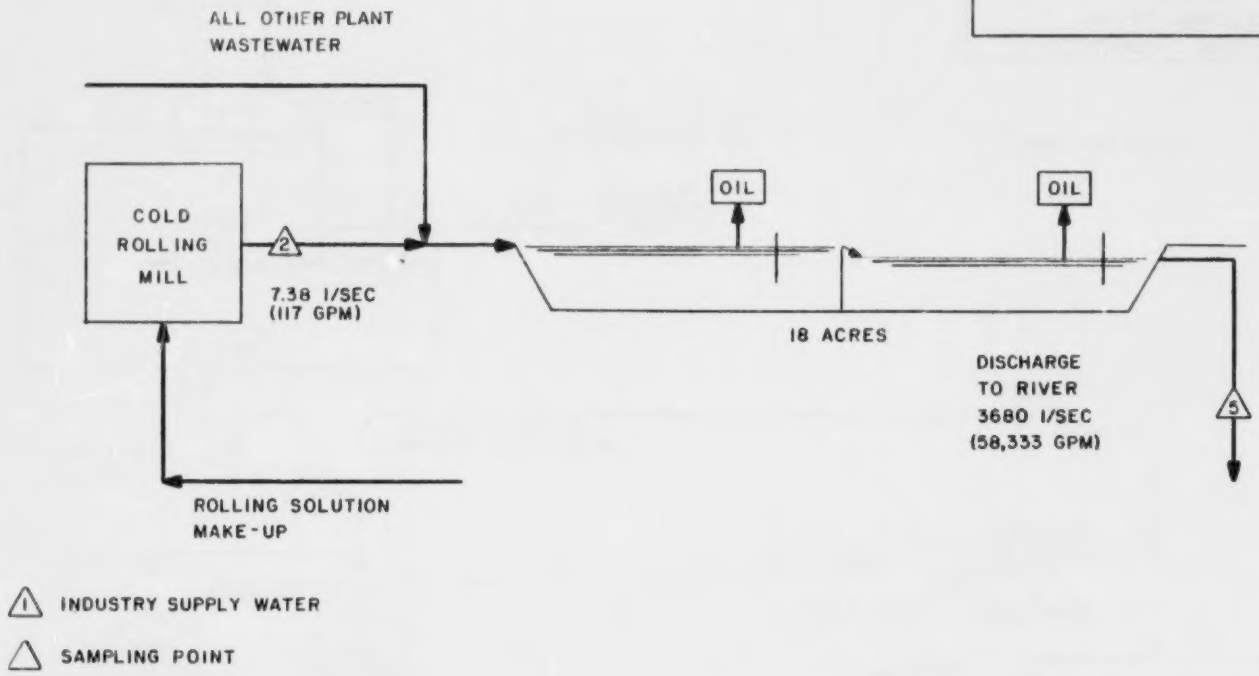
FIGURE VII-4



PROCESS: COLD ROLLING-RECIRCULATION
HCl-CONTINUOUS CONCENTRATED PICKLING-HCl-ACID REGENERATION
PLANT: X-2
PRODUCTION: (COLD ROLLED)
685 METRIC TONS OF STEEL/TURN
(755 TONS OF STEEL/TURN)
(PICKLING)
(380 METRIC TONS OF STEEL/DAY
(521 TONS OF STEEL/DAY)

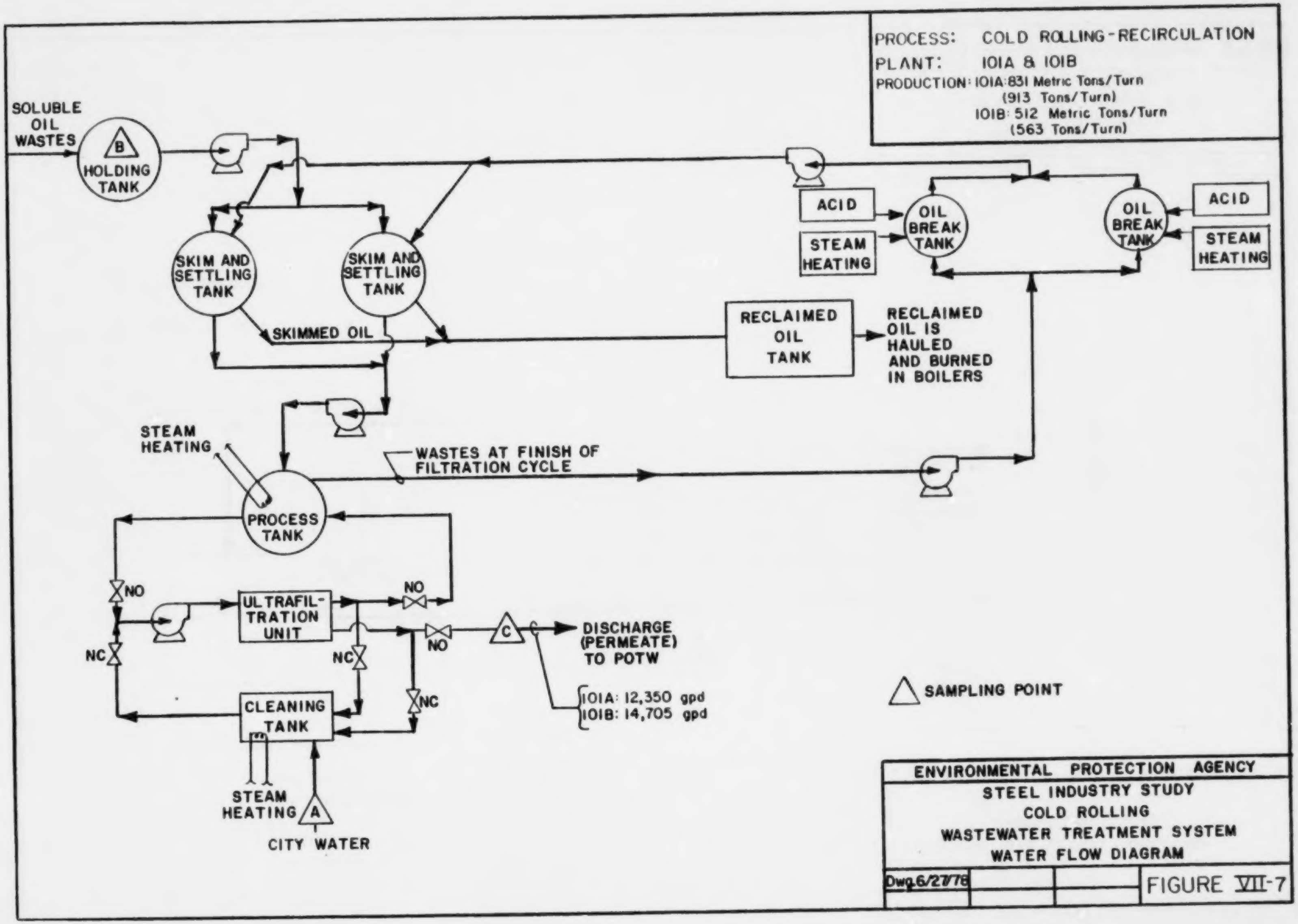
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING AND HCl PICKLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
Dwn.4/23/79
FIGURE VII-5

PROCESS: COLD ROLLING-RECIRCULATION
PLANT: XX-2
PRODUCTION: 363 METRIC TONS/TURN
(400 TONS/TURN)



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM
DWN. 2/2/79

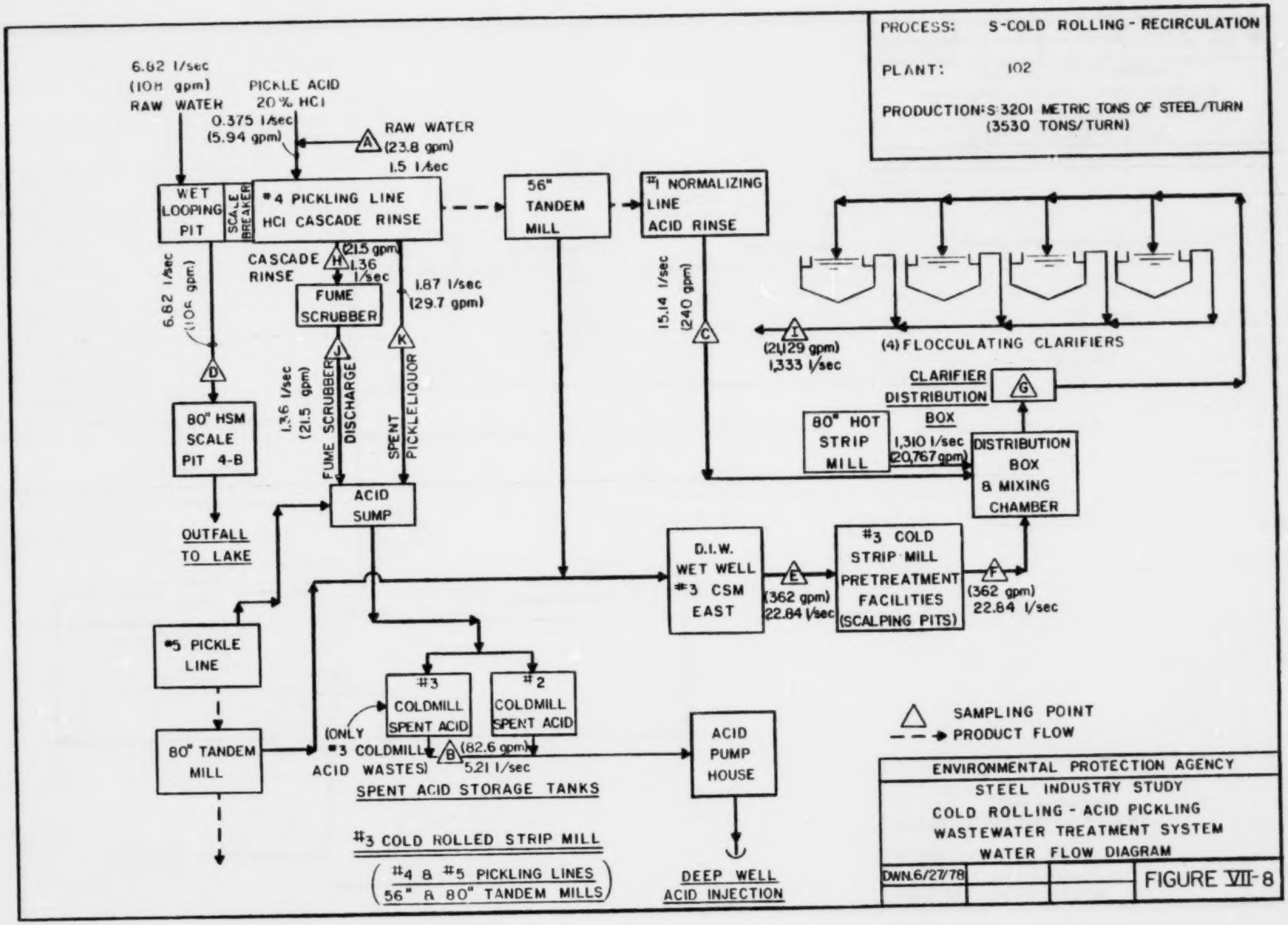
FIGURE VII-6



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwg. 6/27/76

FIGURE VII-7



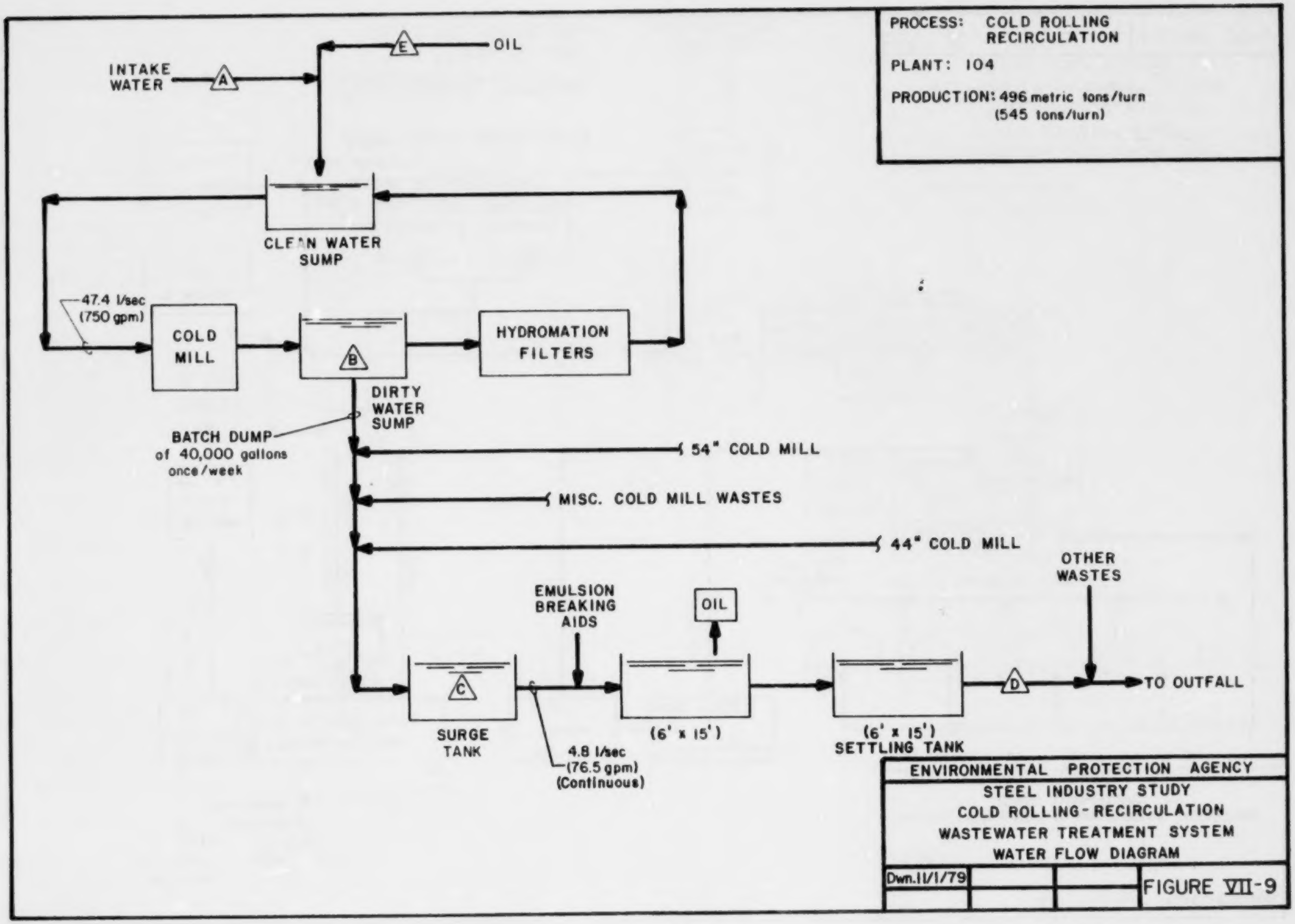
PROCESS: S-COLD ROLLING - RECIRCULATION

PLANT: 102

PRODUCTION: S: 3201 METRIC TONS OF STEEL/TURN
(3530 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING - ACID PICKLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-8



PROCESS: COLD ROLLING RECIRCULATION

PLANT: 104

PRODUCTION: 496 metric tons/turn (545 tons/turn)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

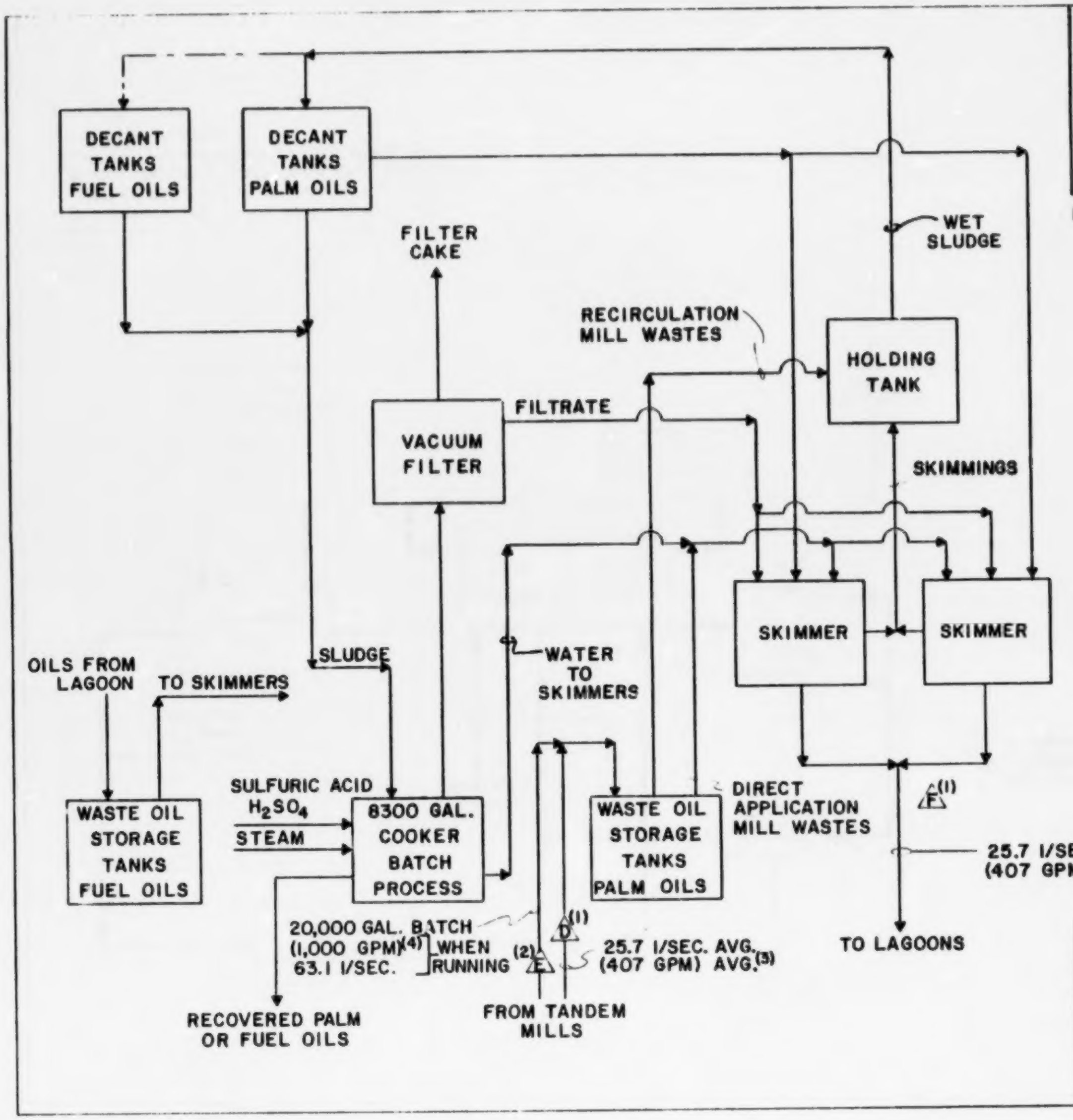
Dwn.11/1/79

FIGURE VII-9

PROCESS: COLD ROLLING-DIRECT APPLICATION AND RECIRCULATION

PLANT: 105

PRODUCTION: RECIRCULATING MILLS
1060 Metric Tons Steel/Turn
(1169 Tons Steel/Turn)
DIRECT APPLICATION MILL
418 Metric Tons Steel/Turn
(461 Tons Steel/Turn)



NOTES:
(1) SAMPLE POINTS △D AND △F REPRESENT RAW WASTES AND TREATED EFFLUENT, RESPECTIVELY, FROM THE DIRECT APPLICATION MILLS.
(2) SAMPLE POINT △E REPRESENTS THE RAW WASTES FROM THE RECIRCULATION MILL. A SEPARATE TREATED EFFLUENT SAMPLE WAS NOT AVAILABLE SINCE THESE WASTES ARE ADMIXED WITH DIRECT APPLICATION MILL WASTES DURING TREATMENT.
(3) MEASURED FLOW VALVE
(4) FLOW ESTIMATED FROM COMPANY DATA.

△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING-DIRECT APPLICATION & RECIRCULATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

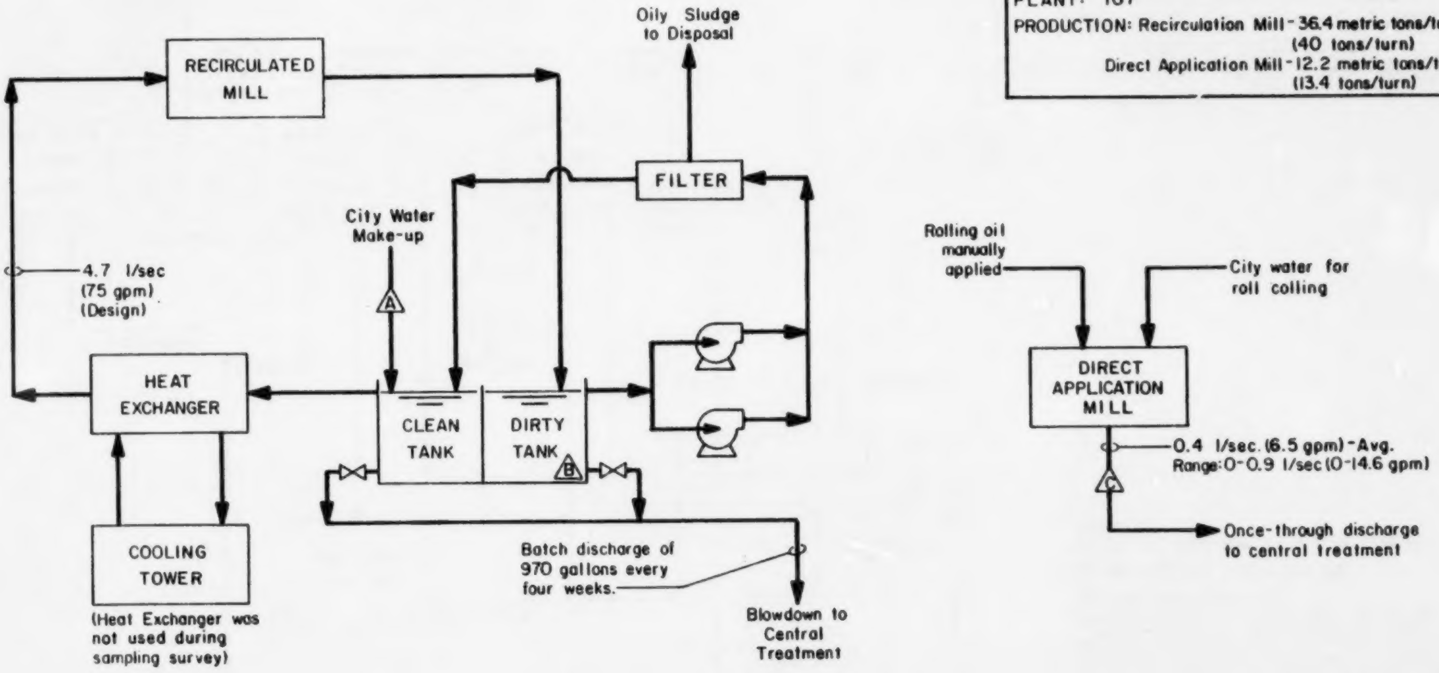
Dwg.8/10/77

FIGURE VII-10

PROCESS: Cold Rolling-Recirculation and
Direct Application

PLANT: 107

PRODUCTION: Recirculation Mill - 36.4 metric tons/turn
(40 tons/turn)
Direct Application Mill - 12.2 metric tons/turn
(13.4 tons/turn)


Oily Sludge to Disposal
RECIRCULATED MILL
FILTER
City Water Make-up
A
4.7 l/sec (75 gpm) (Design)
HEAT EXCHANGER
CLEAN TANK
DIRTY TANK
B
COOLING TOWER
(Heat Exchanger was not used during sampling survey)
Batch discharge of 970 gallons every four weeks.
Blowdown to Central Treatment
Rolling oil manually applied
City water for roll colling
DIRECT APPLICATION MILL
0.4 l/sec. (6.5 gpm) - Avg. Range: 0-0.9 l/sec (0-14.6 gpm)
C
Once-through discharge to central treatment

NOTE

Coils processed at the recirculating mill on the first day of sampling were passed through the mill at least four times. Tonnage for this day was calculated by multiplying the processed tonnage by four.

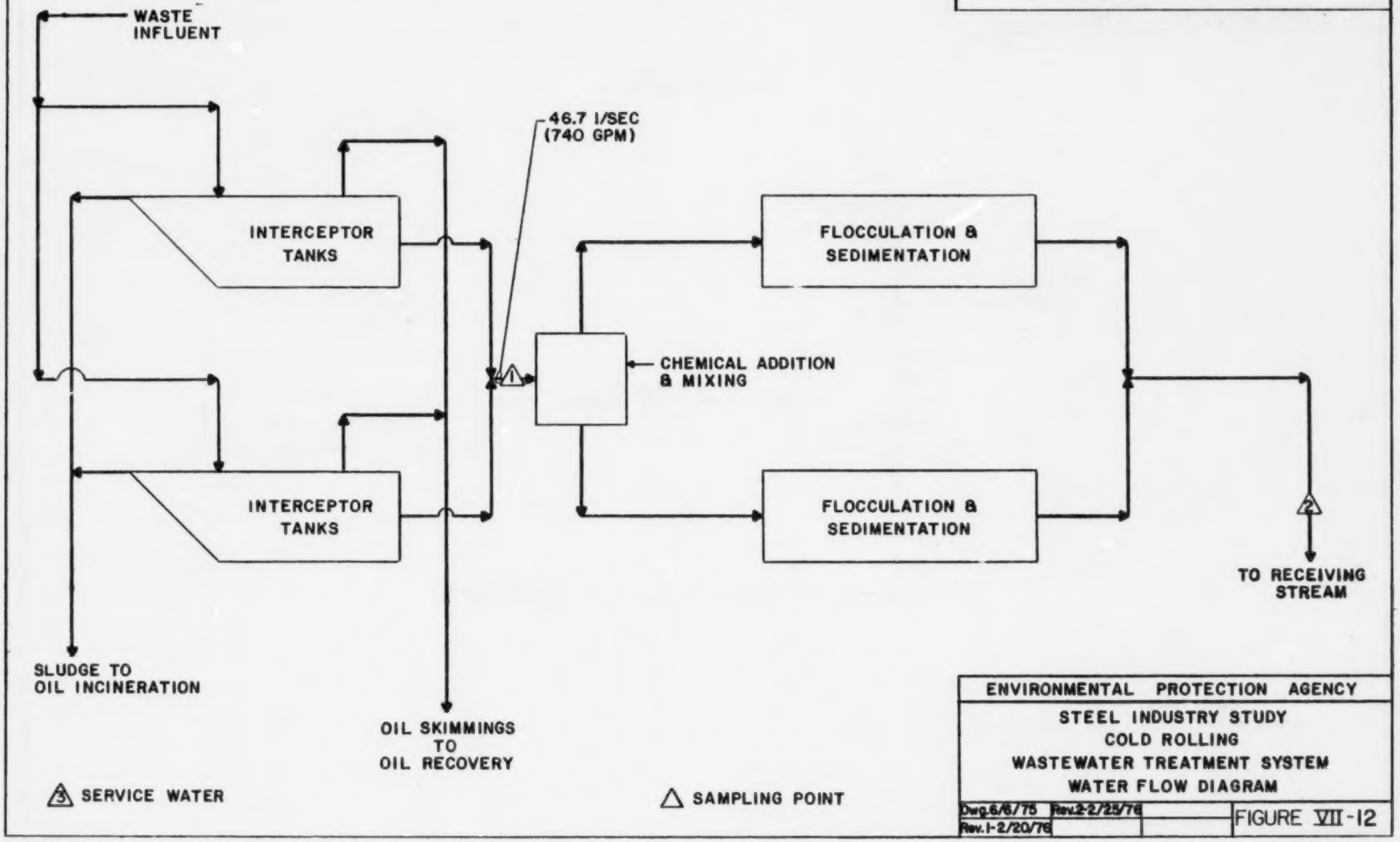
ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-RECIRCULATION & DIRECT APPLICATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 6/27/80

FIGURE VII-11

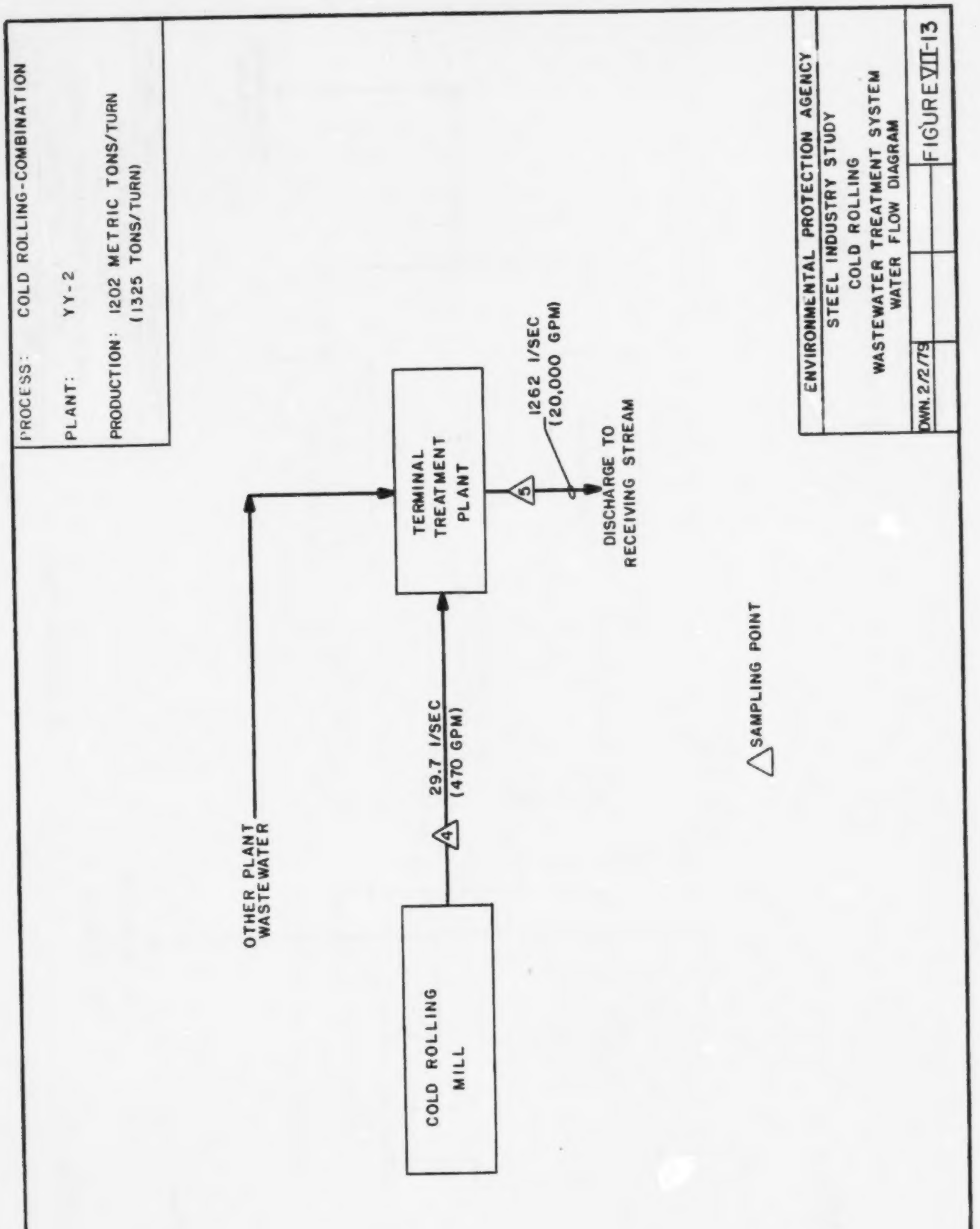
PROCESS: COLD ROLLING- COMBINATION
PLANT: DD-2
PRODUCTION: 630 Metric Tons Steel/ Turn
(695 Tons Steel/ Turn)


WASTE INFLUENT
INTERCEPTOR TANKS
INTERCEPTOR TANKS
46.7 l/SEC (740 GPM)
1
CHEMICAL ADDITION & MIXING
FLOCCULATION & SEDIMENTATION
FLOCCULATION & SEDIMENTATION
2
TO RECEIVING STREAM
SLUDGE TO OIL INCINERATION
OIL SKIMMINGS TO OIL RECOVERY
3 SERVICE WATER
△ SAMPLING POINT

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

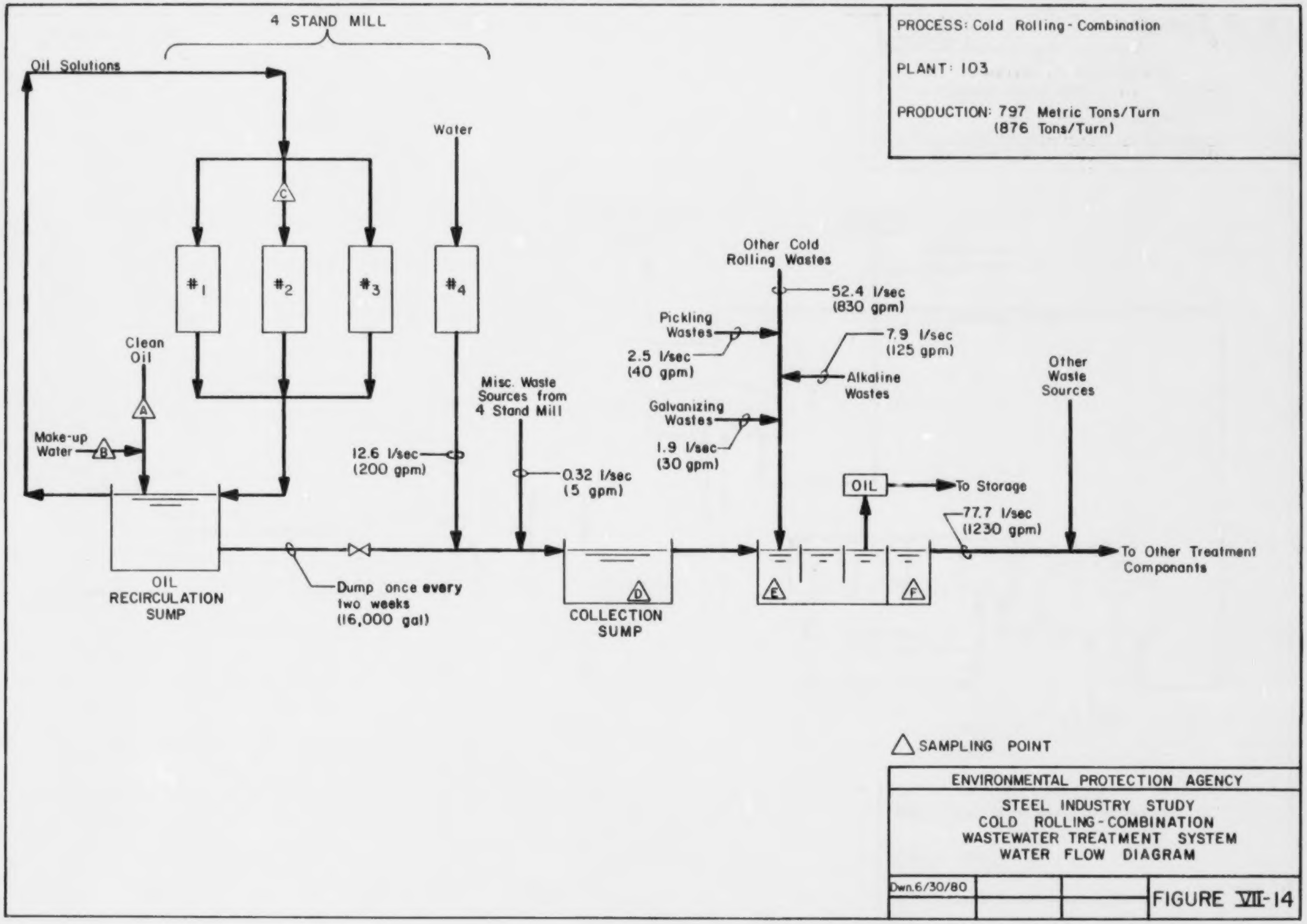
Dwg.6/6/75 Rev.2-2/25/76
Rev.1-2/20/76

FIGURE VII-12



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD ROLLING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

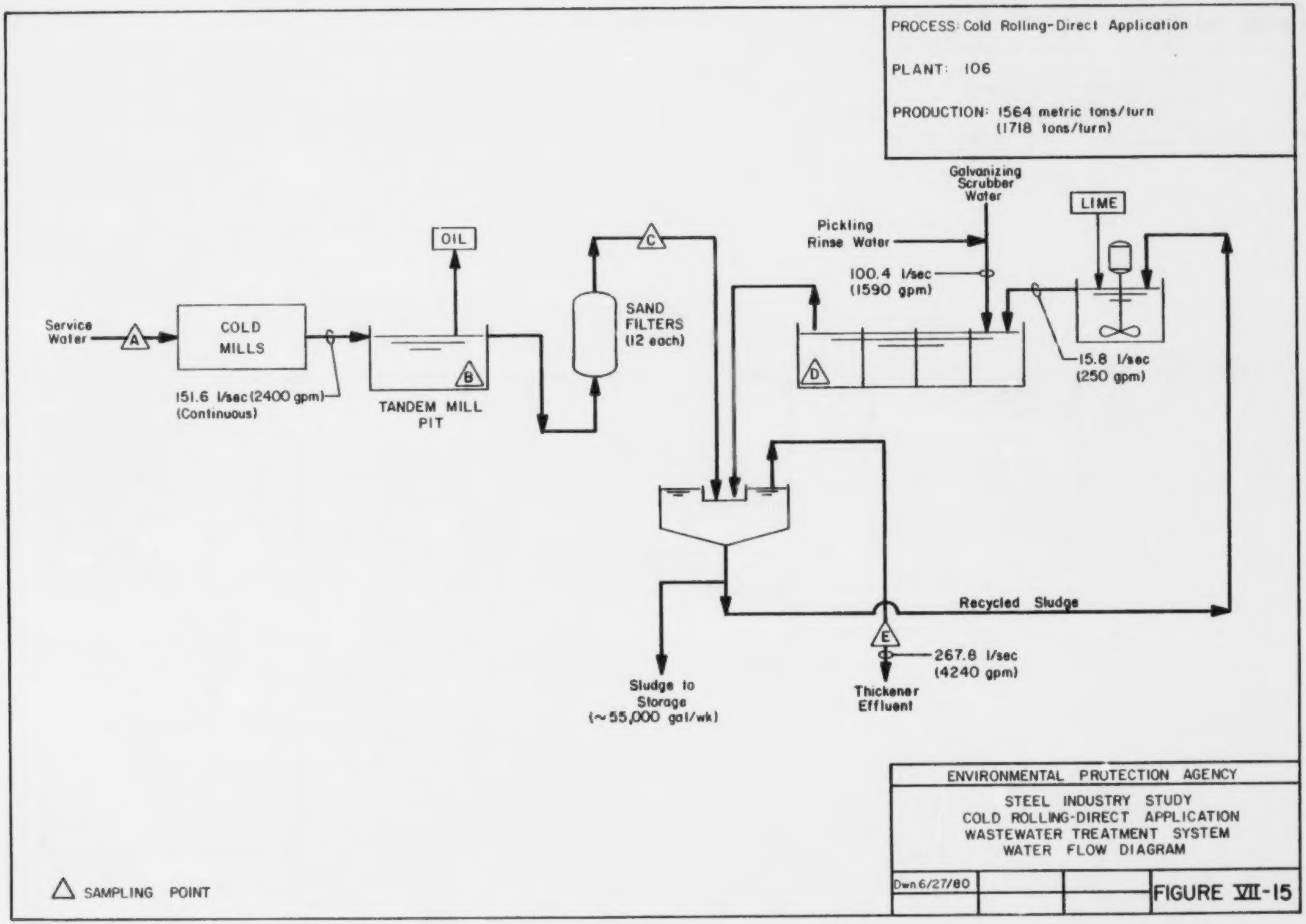
FIGURE VIII-13



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING - COMBINATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-14



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD ROLLING-DIRECT APPLICATION
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-15

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION VIII

COST, ENERGY, AND NONWATER QUALITY IMPACTS

Introduction

This section presents the incremental costs incurred in the application of the different levels of pollution control technology to the cold rolling subdivision based upon the development of treatment system models. Also included are energy requirements, the nonwater quality impacts, and techniques, magnitude, and costs associated with the application of the BPT, BAT, NSPS, PSES, and PSNS levels of treatment. In addition, solid waste generation rates, the BCT cost comparison, and the consumptive use of water are discussed.

Actual Costs Incurred by the Plants Sampled or Solicited for this Study

The effluent treatment costs supplied by the industry for the cold rolling subdivision during sampling visits and in response to the D-DCPs are presented in Tables VIII-1 through VIII-3. These costs have been updated to July 1, 1978 dollars. Many of the industry responses included total costs for central treatment systems. Where possible, these costs were analyzed and allocated to cold rolling wastewaters.

Because of the extensive use of central treatment for cold rolling wastewaters, the Agency could not directly verify its model-based cost estimates for separate treatment of cold rolling wastes with cost data reported by the industry for central treatment systems. However, the Agency did compare its model-based treatment costs with industry costs for several central treatment systems by summing the model-based treatment costs for each subcategory included in the existing central treatment systems. The results of this comparison, which are presented in Volume I, demonstrate that the Agency's costing methodology accurately reflects industry costs for central treatment facilities in general, and for those systems including cold rolling wastewaters in particular. In fact, as shown by the data presented in Volume I, the Agency's cost estimates for separate treatment for finishing operation wastewaters are likely to be significantly higher than industry costs for central treatment.

Control and Treatment Technologies (C&TT) Recommended for Use in the Cold Rolling Subdivision

A review of the treatment components included in the BPT and BAT alternative treatment systems is presented in Table VIII-4. The following items are described for each treatment method in the C&TT table.

1. Status and reliability
2. Problems and limitations
3. Implementation time
4. Land requirements
5. Environmental impacts other than water
6. Solid waste generation

Cost, Energy, and Nonwater Quality Impacts

General Discussion

This section addresses the additional funding that will be required to install and operate the various BPT, BAT, NSPS, PSES and PSNS alternative treatment systems. In addition, it contains a discussion of the air pollution, water consumption, energy requirements, and solid waste disposal impacts associated with each level of treatment. Costs and energy requirements are estimated from alternative treatment systems developed in Sections IX through XIII of this report and are presented in the tables and text of this section.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve the Proposed BPT Limitations

The Agency estimates that the industry will need to spend $30.3 million (capital cost) to bring present water pollution control facilities at cold rolling operations into compliance with the proposed BPT limitations. This $30.3 million is out of a total estimated capital cost of $52.3 million for BPT systems. In addition, the Agency estimates that these systems will require $9.7 million of annual costs to operate. This annual cost estimate takes into account $7.1 million for the recovery and sale of the waste oil solutions. BPT model cost data are provided in Tables VIII-5 through VIII-7.

To estimate the above costs, the Agency developed model plants based upon average plant sizes at the model flow rates (see Section X for a development of these flow rates). Plant by plant capital cost estimates were then made by factoring the production of each plant to the model plant size by the "six-tenth" rule. This method yields cost estimates for the subcategory which are representative of the actual costs spent in the industry. Cost comparisons presented in Volume I verified the accuracy of this costing methodology. Because the DCP responses listed the installed treatment components, costs for "in-place" components were separated from the total estimated cost. These capital cost tabulations are shown in Tables VIII-8 through VIII-12.

The cost estimates were developed based upon the assumption that all plants would install separate wastewater treatment systems. However, as pointed out earlier, wastewaters from most cold rolling operations are treated in central treatment systems. Treatment in central systems reduces costs because of economies of scale and because duplicate equipment components are eliminated. Hence, the Agency expects that the actual cost requirements for cold rolling operations will be less than shown above.

B. Costs Required to Install BAT Treatment Systems

The Agency considered three BAT alternative treatment systems for cold rolling. The details and descriptions of, and rationale for selecting these alternatives are outlined in Section X. The model costs involved in applying each of the BAT alternative treatment system to the BPT model treatment system are presented in Tables VIII-13 through VIII-15. The estimated investment and annual costs for each BAT Alternative follows. These costs were determined by multiplying the unit model costs by the number of cold rolling operations requiring each component.

Alternative	Capital ($ x 10^{-6}) In-Place	Capital ($ x 10^{-6}) Required	Total Annual ($ x 10^{-6})
BAT-1	0	6.07	1.10
BAT-2	0	47.15	85.38
BAT-3	0	63.89	12.94

C. BCT Cost Comparison

The BCT treatment system passed the BCT cost test for both direct application and combination cold rolling operations. Refer to Section XI for a complete review of the BCT cost test analysis. However, the BCT treatment system for recirculation mills did not pass the BCT cost test. The cost test analysis for cold rolling is presented in Table VIII-16. This cost test was completed by dividing the annual cost to achieve the BCT system by the annual loading of conventional pollutants removed from BPT to BCT.

D. Costs Required to Achieve NSPS

The Agency developed two NSPS alternative treatment systems for those cold rolling facilities. The NSPS treatment systems are similar to the BPT and BAT treatment systems. Their costs are presented in Table VIII-17.

E. Costs Required to Achieve the Pretreatment Standards

Pretreatment standards apply to those new and existing plants that discharge to POTW systems. The Agency developed two pretreatment alternative treatment systems for cold rolling operations. The model costs for the Pretreatment Alternatives for Existing Sources (PSES) are presented in Table VIII-18 through VIII-20. Model costs for the Pretreatment Alternatives for New Sources (PSNS) are identical to NSPS costs and are presented in Table VIII-17.

Energy Impacts Due to the Installation of the Requisite Technologies

Moderate amounts of energy are required for the BPT and BAT-1 treatment systems. BAT Alternatives 2 and 3 are very energy intensive, as compared to BPT and BAT-1 treatment systems. The energy requirements for the various levels of treatment are presented below:

A. Energy Impacts at BPT

The estimated energy requirement of 30.5 million kilowatt hours per year for BPT is based upon the installation of the model treatment system for all cold rolling operations with flows similar to that of the treatment model. This estimate represents 0.053% of the 57 billion kilowatt hours of electricity used by the steel industry in 1978. These energy requirements are not excessive compared to the pollution control benefits derived from compliance with the proposed BPT limitations.

B. Energy Impacts at BAT

Additional energy will be required at BAT due to the installation of additional energy consuming equipment. The additional energy needs for the three BAT alternative treatment systems, along with the percentage of total energy consumption for each BAT alternative, are summarized below.

BAT Alternative	kwh per year	% of Industry Usage
No. 1	11.61 million	0.020
No. 2	68.66 million	0.12
No. 3	1.25 billion	2.19

C. Energy Impacts at NSPS and Pretreatment

The Agency did not estimate the total impacts for NSPS and PSNS since an estimate of the number of new source cold rolling operations were not made as part of this study. Energy impacts for PSES are included in those considered for BPT and BAT above. The energy requirements and annual costs for the model sized plants are listed below:

	Energy (kw)	Annual Cost ($)
NSPS & PSNS-1	14.8	3,100
NSPS & PSNS-2	22.5	4,700
Recirculation		
PSES-1	20.6	4,300
PSES-2	35.4	7,400
Combination		
PSES-1	150.9	31,500
PSES-2	339.6	70,900
D. Application		
PSES-1	134.6	28,100
PSES-2	320.9	67,000

Nonwater Quality Impacts

In this analysis, the Agency investigated three impacts: air pollution, solid waste disposal, and water consumption. A discussion of these impacts is presented below.

A. Air Pollution

Only if the waste oils are incinerated could there be a potential air pollution problem. Disposal by incineration is not a requirement established by this regulation. However, the Agency concludes that such impacts would not be significant provided proper combustion and air emission controls were practiced.

B. Solid Waste Disposal

The treatment components incorporated in both BPT and BAT treatment systems generate large amounts of solid waste in the form of sludges. These sludges result from the removal of suspended solids and oil and grease. The following table presents a summary of the quantity of solid waste produced with both the BPT and BAT treatment systems for the cold rolling subdivision.

Solid Waste Generation For Cold Rolling

Treatment Level	Dewatered Solids (Tons/Year)	Oil and Grease (Gal/Year)
BPT	127,550	44,500,000
BAT-1	3,450	76,700
BAT-2	3,450	76,700
BAT-3	8,628	153,394

As shown above, a large amount of solid waste is generated at the BPT level of treatment, while the BAT treatment systems generate lesser amounts. In addition, solid waste is generated at the NSPS, and Pretreatment levels as noted below for the model plants.

Solid Waste Generation
For Cold Rolling

Treatment Level	Dewatered Solids (Tons/Year)	Oil and Grease (Gal/Year)
NSPS-1	696	0.49 million
NSPS-2	696	0.49 million
PSES-1	696	0.49 million
PSES-2	696	0.49 million
PSNS-1	696	0.49 million
PSNS-2	696	0.49 million

The NSPS and Pretreatment models are similar to BPT/BAT treatment systems. The solid waste generation, shown in the above table, is based upon the sum of the BPT and BAT generation rates previously established.

Some of the solid wastes result from the use of lime in the treatment systems. Lime is used to raise pH levels after the emulsion breaking step and can produce up to 8-10 tons of sludge per day in the form of untreated calcium hydroxide, along with precipitated calcium carbonates. Disposal of these sludges adds significantly to costs, and care must be taken to prevent sludges from redissolving and entering streams as runoff from landfill sites.

Additional solids may be generated depending upon the BAT alternative. If the filter system proposed in Alternative 1 is installed, additional solid wastes will be produced when the filters are backwashed. If the systems including activated carbon are installed additional solid wastes will also be generated as carbon that cannot be reactivated in the carbon column system is disposed. However, the volume of sludges generated at BAT is small compared to the amount generated at the BPT level.

Notwithstanding the above, the Agency believes that the effluent reduction benefits associated with compliance with the proposed limitations and standards justify any adverse environmental impacts associated with solid waste disposal.

C. Water Consumption

No significant water consumption is expected to occur at cold rolling mills as a result of the installation of the alternative treatment systems. Recycle systems are installed at recirculation mills, but these are usually closed systems with no inherent water consumption. There are no other opportunities for water consumption in cold rolling operations.

Summary of Impacts

The Agency concludes that the pollution control benefits described below for the cold rolling subdivision justify any adverse environmental impacts associated with energy consumption, air pollution, solid waste disposal, and water consumption.

	Effluent Loadings (Tons/Year)		
	Raw Waste	Proposed BPT	Proposed BAT and BCT
Flow, MGD	39.4	39.4	39.4
Suspended Solids	16,290	3,130	860
Oil and Grease	112,500	1,250	285
Toxic Metals	185	38	34
Toxic Organics	280	265	33

TABLE VIII-1

EFFLUENT TREATMENT COSTS
COLD ROLLING - RECIRCULATION

(All costs are expressed in July, 1978 Dollars.)

Plant Code	BB-2*	EE-2*	X-2(1)	XX-2*	101	102*	-
Reference Code	060-03	1120-01	060B-03	684I-01	020B&020C	384A(02&03)	684F-03(2)
Initial Investment Cost	1,361,231	436,693	2,469,600	430,091	712,200	1,782,070	863,564
Annual Cost							
Cost of Capital	57,171	18,341	106,200	18,064	30,625	82,781	37,100
Depreciation	136,125	43,669	246,960	43,009	71,220	197,097	86,360
Operation and Maintenance	81,096	180,521	194,500	2,489	170,900	49,657	11,000
Energy, Power, Chemicals, etc.	10,569	116,484	-	-	-	-	-
Other	-	-	-	-	-	36,583	56,800
TOTAL	284,959	359,015	594,860	70,563	272,745	366,118	181,360
$/Ton	0.17	0.26	0.93	0.22	0.57	0.39	0.19

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(1) Reported costs are for a treatment system which treats two cold rolling mills. Costs to treat the individual operation sampled were unable to be broken out.

(2) The costs for this operation were supplied in the response to the D-DCP.

*: Portion of costs attributable to this subcategory.

TABLE VIII-2

EFFLUENT TREATMENT COSTS
COLD ROLLING - COMBINATION

Plant Code Reference Code	DD-2* 584E-01	YY-2* 432D-01
Initial Investment Cost	3,913,654	166,907
Annual Cost		
Cost of Capital	164,373	7,000
Depreciation	391,366	16,691
Operation and Maintenance	250,105	7,898
Energy & Power	191,552	2,538
TOTAL	997,402	34,137
$/Ton	0.65	0.048

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* Portion attributed to this subcategory only.

TABLE VIII-3

EFFLUENT TREATMENT COSTS
COLD ROLLING - DIRECT APPLICATION

Plant Code	105*
Reference No.	584F-04
Initial Investment Cost	2,804,245
Annual Costs	
Cost of Capital	Annual costs not available since company accounting procedures do not segregate production and pollution operating costs.
Depreciation	
Operation and Maintenance	
Energy and Power	
TOTAL	
$/Ton	Unk

---

* Portion attributed to this subcategory only.

TABLE VIII-4

CONTROL AND TREATMENT TECHNOLOGIES
COLD ROLLING

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Oil separator - used to treat wastewaters from the cold rolling mill to remove any floating oils that may be present.	Most mills have oil separators of some type with most being either surface skimming or gravity separation types.	Primarily removes only floating oils.	Included in Step B Implementation time	Contained within an equalization tank, Step B.	None	Recovered oils can be reused in the rolling mills, sold to contractors who reprocess used oils or can be burned as a fuel.
B. Equalizaiton tank - to protect treatment system from shock or high toxic loads.	Practiced at many mills in cold rolling to equalize oily wastes prior to further treatment.	Generally, no problems. Size is most important parameter.	9 months	50'x50'	None	Slight buildup of solids in system which must be properly disposed.
C. Alum addition - used in conjunction with Step D to break emulsion.	Widely practiced in cold rolling mill treatment systems.	Increased chemical costs and some increase in solids load.	6 months	No additional space required.	None	Slight addition to solid waste generated.
D. Acid addition - used to lower the pH to 4-5, in conjunction with Step C, to break emulsion.	Widely practiced in this subcategory.	Increased cost unless source of acid exists at plant.	6 months	No additional space required.	None	None
E. Lime neutralization - to raise pH to 6-9 in a mixing tank, following Step D.	Widely practiced at cold rolling mills.	Increased chemical costs. Also, this step generates a significant solids loading that requires additional treatment, before discharge.	6 months	25'x25'	None	Can produce 8-10 tons of sludge per day. This sludge can be difficult to dispose of due to its consistency.

TABLE VIII-4
CONTROL AND TREATMENT TECHNOLOGIES
COLD ROLLING
PAGE 2

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
F. Polymer addition - add polymer or polyelectrolyte to promote settling.	Widely practiced in cold rolling mills throughout the steel industry.	Increased chemical costs.	6 months	No additional space required.	None	No significant amount of sludge generated.
G. Air flotation - effluent from Step F treated with air flotation, for solids separation.	Used by numerous cold rolling plants.	Requires car not to disturb flotants prior to removal.	12 months	25'x25' (for all rolling operations).	Possibility of obnoxious gases in immediate area surrounding the unit.	Oils recovered from flotation unit may be reused, sold to an oil reprocessing contractor or used as fuel.
H. Settling lagoon - effluent from Step G settled in a settling pond or lagoon (last step in BPT).	Widley practiced at many mills in this subcategory and in ohter areas of the steel industry.	Requires considerable space to intall.	9-12 months	40'x40' (recirculation) 210'x210' (combination) 260'x260' (direct application)	Possibility of producing objectional odors; aesthetically unattractive.	Sludges accumulate in lagoons, must be periodically removed and properly disposed of.
I. Filtration - effluent from Step H is treated by passage through a mixed-media filter unit (last step in BAT-1).	Used at several mills and numerous steel plants.	Will primarily remove solids and oils. Increased capital and operating costs.	15-18 months	25'x25' (recircula- 40'x40' (combination) 50'x50' (direct application)	None	Some additional sludge will be generated when the filters are backwashed.
J. Activated carbon columns - effluent from Step I is passed through activated carbon columns (last step in BAT-2).	Practiced at two plants in the steel industry, and also in the organic chemicals and petroleum industries.	Significant increase in capital and operating costs, especially if on-site carbon regeneration is required.	18 months	50'x50'	Consumes energy to reactivate carbon.	Spent carbon that cannot be reactivated must be disposed of.

TABLE VIII-4
CONTROL AND TREATMENT TECHNOLOGIES
COLD ROLLING
PAGE 3

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
K. Evaporation - effluent from Step J is passed through a vapor decompression evaporation system to achieve zero discharge.	Not demonstrated in the steel industry. However, used at a few plants in the power industry.	Requires maintenance economics. Dependent on the integration of this system into the water cycle.	18 months	60'x60'	Uses approximately 90 kwh/ 1000 gallons of feedwater.	Slurry generated in this process must be dewatered. Sludge generation is increased.
L. Recycle - distillate quality water from Step K is recycled through the plant for reuse (last Step in BAT-3).	Widely practiced throughout the iron and steel industry.	Essentially no problems involved.	18 months	25'x25'	None	None

TABLE VIII-5

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling
: Recirculation
: Carbon-Specialty

Model Size-TPD : 1700
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	A	B	C(2)	D(2)	E(2)	F	G	H	Total
Investment $\$ \times 10^{-3}$	43	49	81	76	83	78	72	27	509
Annual Cost $\$ \times 10^{-3}$									
Capital	1.8	2.1	3.5	3.3	3.6	3.3	2.1	1.1	20.8
Depreciation	4.3	4.9	8.1	7.6	8.3	7.8	7.2	2.7	50.9
Operation & Maintenance	1.5	1.7	2.8	2.6	2.9	2.7	2.5	0.9	17.6
Sludge Disposal(1)	-	-	-	-	-	-	-	0.2	0.2
Energy & Power	-	-	0.3	0.2	0.5	0.5	1.2	-	2.7
Chemical Costs	-	-	0.9	0.4	0.5	1.3	-	-	3.1
Oil Disposal	0.8	-	-	-	-	-	-	-	0.8
TOTAL	8.4	8.7	15.6	14.1	15.8	15.6	13.0	4.9	96.1

	Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
	Flow, gal/ton	25	25
	Suspended Solids	1000	25
	Oil & Grease	20000	10
	Dissolved Iron	100	1.0
	pH (Units)	6-9	6-9
6	Carbon Tetrachloride	0.02	0.02
11	1,1,1-Trichloroethane	0.10	0.10
23	Chloroform	0.10	0.10
24	2-Chlorophenol	6.00	6.00
34	2,4-Dimethylphenol	4.20	4.20
38	Ethylbenzene	0.07	0.05
55	Naphthalene	0.09	0.05
57	2-Nitrophenol	12.00	12.00
60	4,6-Dinitro-o-cresol	0.20	0.20

TABLE VIII-5
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
65 Phenol	0.02	0.02
78 Anthracene	3.00	0.01
80 Fluorene	0.03	0.01
85 Tetrachloroethylene	0.30	0.30
86 Toluene	0.04	0.04
87 Trichloroethylene	0.03	0.03
114 Antimony	0.03	0.03
115 Arsenic	0.30	0.30
118 Cadmium	0.10	0.10
119 Chromium	2.00	0.50
120 Copper	4.20	0.50
122 Lead	2.70	0.50
124 Nickel	2.20	0.50
128 Zinc	2.00	0.50
130 Xylene	1.50	1.50

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(1) Costs are all power unless otherwise noted.
(2) Treatment components are used in tandem.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Oil Separator
B: Equilization
C: Alum Addition
D: Acid Addition to break oil emulsion
E: Lime Neutralization
F: Polymer Addition
G: Air Flotation
H: Settling Lagoon

TABLE VIII-6

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling
: Combination
: Carbon-Specialty

Model Size-TPD : 4400
Oper. Days/Year: 348
Turns/Day : 3

C&TT Step	A	B	C(2)	D(2)	E(2)	F	G	H	Total
Investment \$ x 10^{-3}	136	315	223	161	296	201	259	229	1820
Annual Cost \$ x 10^{-3}									
Capital	5.8	13.6	9.6	6.9	12.7	8.7	11.1	9.8	78.2
Depreciation	13.6	31.5	22.3	16.1	29.6	20.1	25.9	22.9	182.0
Operation & Maintenance	4.7	11.0	7.8	5.6	10.4	7.0	9.0	8.0	63.5
Sludge Disposal(1)	-	-	-	-	-	-	-	7.4	7.4
Energy & Power	-	-	3.9	3.6	4.4	4.4	10.9	-	27.2
Chemical Costs	-	-	35.8	13.5	17.9	45.7	-	-	112.9
Oil Disposal	30.2	-	-	-	-	-	-	-	30.2
TOTAL	54.3	56.1	79.4	45.7	75.0	85.9	56.9	48.1	501.4

	Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
	Flow, gal/ton	400	400
	Susp. Solids	600	25
	Oil & Grease	1000	10
	Diss. Iron	10	1.0
	pH, Units	6-9	6-9
6	Carbon Tetrachloride	0.02	0.02
11	1,1,1-Trichloroethane	0.10	0.08
23	Chloroform	0.15	0.10
24	2-Chlorophenol	3.00	3.00
34	2,4-Dimethylphenol	2.00	2.00
38	Ethylbenzene	0.03	0.03
55	Naphthalene	0.02	0.02
57	2-Nitrophenol	6.00	6.00
60	4,6-Dinitro-o-cresol	0.10	0.10

TABLE VIII-6
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE TWO

Effluent Quality(3)		Raw Waste Level	BPT Effluent Level
65	Phenol	0.10	0.10
78	Anthracene	0.20	0.01
80	Fluorene	0.01	0.01
85	Tetrachloroethylene	0.15	0.15
86	Toluene	0.02	0.02
87	Trichloroethylene	0.02	0.02
114	Antimony	0.02	0.02
115	Arsenic	0.10	0.10
118	Cadmium	0.08	0.08
119	Chromium	1.00	0.50
120	Copper	2.00	0.50
122	Lead	1.50	0.50
124	Nickel	0.90	0.50
128	Zinc	0.90	0.50
130	Xylene	0.35	0.35

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(1) Costs are all power unless otherwise noted.
(2) Treatment components are used in tandem.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A:	Oil Separator	E:	Lime Neutralization
B:	Equalization	F:	Polymer Addition
C:	Alum Addition	G:	Air Flotation
D:	Acid Addition to break oil emulsion	H:	Settling Lagoon

TABLE VIII-7

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling — Model Size-TPD : 2900
: Direct Application — Oper. Days/Year: 348
: Carbon-Specialty — Turns/Day : 3

C&TT Step	A	B	C(2)	D(2)	E(2)	F	G	H	Total
Investment \$ x 10^{-3}	194	407	289	208	392	284	371	342	2487
Annual Cost \$ x 10^{-3}									
Capital	8.3	17.5	12.4	9.0	16.9	12.2	16.0	14.7	107.0
Depreciation	19.4	40.7	28.9	20.8	39.2	28.4	37.1	34.7	249.2
Operation & Maintenance	6.8	14.2	10.1	7.3	13.7	9.9	13.0	12.0	87.0
Sludge Disposal	-	-	-	-	-	-	-	12.2	12.2
Energy & Power	-	-	6.1	5.6	7.8	7.9	16.3	-	43.7
Chemical Costs	-	-	59.0	22.3	29.5	75.8	-	-	186.6
Oil Disposal	49.7	-	-	-	-	-	-	-	49.7
TOTAL	84.2	72.4	116.5	65.0	107.1	134.2	82.4	73.6	734.9

	Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
	Flow, gal/ton	1000	1000
	Suspended Solids	100	25
	Oil & Grease	1025	10
	Dissolved Iron	25	1.0
	pH (Units)	6-9	6-9
4	Benzene	0.01	0.01
6	Carbon Tetrachloride	0.01	0.01
11	1,1,1-Trichloroethane	0.05	0.05
78	Anthracene	0.03	0.03
85	Tetrachloroethylene	0.03	0.03

TABLE VIII-7
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
115 Arsenic	0.02	0.02
117 Beryllium	0.01	0.01
119 Chromium	0.10	0.10
120 Copper	0.16	0.15
122 Lead	0.40	0.40
124 Nickel	0.30	0.30
128 Zinc	0.15	0.15

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(1) Costs are all power unless otherwise noted.
(2) Treatment components are used in tandem.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Oil Separator
B: Equilization
C: Alum Addition
D: Acid Addition to break oil emulsion
E: Lime Neutralization
F: Polymer Addition
G: Air Flotation
H: Settling Lagoon

TABLE VIII-8

BPT CAPITAL COST TABULATION
BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Rolling - Recirculation
: Carbon

Plant Code	TPD	C&TT STEP A	B	C	D	E	F	G	H	In Place	Required	Total
0060	9435	120	136	227	211	233	217	201	74	845	574	1419
0060B	2679	56	64	107	99	110	102	94	35	185	482	667
0112A	816	28	31	52	49	54	50	46	17	247	80	327
0112D	4107	73	83	138	128	142	132	122	45	597	266	863
0256A	276	14	16	27	25	28	26	24	9	14	155	169
0256B	180	11	13	21	20	22	20	19	7	0	133	133
0284A	219	13	14	24	22	24	23	21	8	0	149	149
0320	3295	64	72	121	112	124	115	107	40	0	755	755
0384A	9110	117	133	223	207	228	212	197	73	827	563	1390
0396D	405	18	21	34	32	35	33	30	11	29	185	214
0396E	240	6	7	11	11	12	11	10	4	0	72	72
0432A	2817	58	66	110	102	113	105	97	36	417	270	687
0432B	1827	45	51	85	79	87	81	75	28	73	458	531
0432C	3132	62	70	117	109	120	112	104	38	506	226	732
0448A	780	27	31	51	47	52	49	45	17	45	274	319
0528B	2862	59	67	111	103	114	106	98	36	209	485	694
0580C	161	10	12	20	18	20	19	17	6	0	122	122
0584E	870	29	33	54	51	56	52	48	18	95	246	341
0584F	5613	88	100	166	155	171	159	147	54	560	480	1040
0648	68	6	7	12	11	12	11	10	4	6	67	73
0684B	1569	41	46	77	72	79	74	69	25	66	417	483
0684F	5337	85	97	162	150	166	154	143	53	860	150	1010
0684I	2100	49	55	92	86	95	88	82	30	216	361	577
0760	659	24	28	46	43	47	44	41	15	15	273	288
0792B	666	24	28	46	43	48	44	41	15	0	289	289
0792C	375	17	20	33	31	34	31	19	11	46	160	206

TABLE VIII-8
BPT CAPITAL COST TABULATION
PAGE 2

Plant Code	TPD	C&TT STEP A	B	C	D	E	F	G	H	In Place	Required	Total
0856P	822	28	31	53	49	54	50	46	17	28	300	328
0860B	6438	95	108	181	168	185	173	160	59	861	268	1129
0864B	4218	74	84	140	130	144	134	124	46	606	270	876
0948C	894	29	33	55	51	57	53	49	18	255	90	345
										7608	8620	16228

Note: Underlined costs represent facilities in place; where two figures appear in the same column, the underlined portion is in place; the non-underlined portion remains to be installed.

TABLE VIII-9

BPT CAPITAL COST TABULATION
BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Rolling - Recirculation
: Specialty

Plant Code	TPD	C&TT STEP A	B	C	D	E	F	G	H	In Place	Required	Total
0020B	1365	38	43	71	66	73	68	63	23	0	445	445
0020C	1975	62	70	117	109	120	112	56-47	21-17	77	654	731
0060D	2496	54	61	102	95	105	98	91	33	0	639	639
0060E	339	16	19	31	29	32	29	27	10	98	95	193
0060I	16	3	4	5	5	5	5	4	2	0	32	32
0528	447	19	22	36	34	37	35	32	12	51	176	227
0684D	1011	31	36	60	55	61	57	53	19	50	322	372
0856E	249	14	15	26	24	26	25	23	8	0	161	161
										*276	2524	2800

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*Total does not include confidential plants.

Note: Underlined costs represent facilities in place, where two figures appear in the same column, the underlined portion is in place; the non-underlined portion remains to be installed.

TABLE VIII-10

BPT CAPITAL COST TABULATION
BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Rolling - Direct Application
: Carbon

		C&TT STEP										
Plant Code	TPD	A	B	C	D	E	F	G	H	In Place	Required	Total
0060	7323	151	416	296	212	396	269	269	297	0	2306	2306
0060B	1146	50	137	97	70	130	88	88	98	236	522	758
0112A	9624	177	490	349	250	466	317	317	350	1976	740	2716
0112B	12150	204	563	401	287	536	364	364	403	1507	1615	3122
0320	2310	75	208	148	106	198	135	135	149	0	1154	1154
0384A	1356	55	151	108	77	144	98	98	108	163	676	839
0584A	1491	58	160	114	82	152	104	104	114	172	716	888
0584C	2102	71	197	140	100	187	127	127	141	339	751	1090
0584F	2949	87	241	172	123	229	156	156	172	783	553	1336
0684C	1143	49	136	97	70	130	88	88	98	147	609	756
0856F	804	40	110	79	56	105	71	71	79	255	356	611
0860B	855	42	115	82	58	109	74	74	82	447	189	636
0920A	1953	68	188	134	96	179	122	122	135	0	1044	1044
0920G	2348	76	210	150	107	200	136	136	150	362	803	1165
0948A	2880	86	237	169	121	226	154	154	170	959	358	1317
										7346	12392	19738

Note: Underlined costs represent facilities in place, where two figures appear in the same column, the underlined portion is in place; the non-underlined portion remains to be installed.

TABLE VIII-11

BPT CAPITAL COST TABULATION
BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Rolling - Direct Application
: Specialty

Plant Code	TPD	C&TT STEP A	B	C	D	E	F	G	H	In Place	Required	Total
0060D	408	27	74	52	37	70	48	48	53	123	286	409
0176	696	37	101	72	52	96	66	66	72	262	300	562
0256N	1.5	1	3	2	1	2	2	2	2	1	14	15
										386	600	986

Note: Underlined costs represent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the non-underlined portion remains to be installed.

TABLE VIII-12

BPT CAPITAL COST TABULATION
BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Rolling - Combination
: Carbon

Plant Code	TPD	C&TT STEP A	B	C	D	E	F	G	H	In Place	Required	Total
0432D	3486	72	197	148	105	196	134	134	135	331	790	1121
0448A	2112	53	146	109	78	145	99	99	100	100	729	829
0548A	4437	83	228	171	122	227	155	155	156	776	521	1279
0584E	6003	99	274	204	146	272	186	186	187	472	1082	1554
0856D	7194	111	305	228	163	303	207	207	208	546	1186	1732
0856F	4914	81	92	154	143	158	147	136	50	517	444	961
0860B	3105	67	184	138	98	183	125	125	126	670	376	1046
0868A	4902	88	242	181	129	241	165	165	166	1067	310	1377
0920C	2120	53	147	110	78	146	100	100	100	399	435	834
0948C	8250	120	331	247	177	329	225	225	226	1549	331	1880
										6427	6204	12631

Note: Underlined costs represent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the non-underlined portion remains to be installed.

TABLE VIII-13

ALTERNATIVE BAT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling-Recirculation
: Carbon-Specialty

Model Size-TPD : 1700
Oper. Days/Year: 348
Turns/Day : 3

Alternative C&TT Steps	1		2			3		
	I	Total	I	J	Total	K	L	Total
Investment $ x 10^{-3}	132	132	132	893	1025	1309	80	1389
Annual Costs $ x 10^{-3}								
Capital	5.7	5.7	5.7	38.4	44.1	56.2	3.4	59.6
Depreciation	13.2	13.2	13.2	89.3	102.5	130.9	8.0	138.9
Operation & Maintenance	4.6	4.6	4.6	31.2	35.8	45.8	2.8	48.6
Energy & Power(1)	0.5	0.5	0.5	3.1	3.6	33.8	0.3	34.1
Carbon Regeneration	-	-	-	1670.0	1670.0	-	-	-
TOTAL	24.0	24.0	24.0	1832.0	1856.0	266.7	14.5	281.2

	Effluent Quality(2)	BAT Feed Level	BAT No. 1 Effluent Level*	BAT No. 2 Effluent Level	BAT No. 3 Effluent Level
	Flow, gal/ton	25	25	25	0
	Suspended Solids	25	15	15	-
	Oil & Grease	10	5	5	-
	Dissolved Iron	1.0	1.0	1.0	-
	pH, Units	6-9	6-9	6-9	-
6	Carbon Tetrachloride	0.02	0.02	0.02	-
11	1,1,1,-Trichloroethane	0.10	0.10	0.10	-
23	Chloroform	0.10	0.10	0.02	-
24	2-Chlorophenol	6.0	6.0	0.05	-
34	2,4-Dimethylphenol	4.2	4.2	0.05	-
38	Ethylbenzene	0.05	0.05	0.05	-
55	Naphthalene	0.05	0.05	0.025	-
57	2-Nitrophenol	12.0	12.0	0.05	-
60	4,6-Dinitro-o-cresol	0.20	0.025	0.025	-

TABLE VIII-13
ALTERNATIVE BAT MODEL COSTS: BASIS 7/1/78 DOLLARS
COLD ROLLING - RECIRCULATION
PAGE 2

Effluent Quality(2)		BAT Feed Level	BAT No. 1 Effluent Level*	BAT No. 2 Effluent Level	BAT No. 3 Effluent Level
65	Phenol	0.02	0.02	0.02	-
78	Anthracene	0.01	0.01	0.01	-
80	Fluorene	0.01	0.01	0.01	-
85	Tetrachloroethylene	0.30	0.05	0.05	-
86	Toluene	0.04	0.04	0.02	-
87	Trichloroethylene	0.03	0.03	0.03	-
114	Antimony	0.03	0.03	0.03	-
115	Arsenic	0.30	0.10	0.10	-
118	Cadmium	0.10	0.10	0.10	-
119	Chromium	0.50	0.10	0.10	-
120	Copper	0.50	0.10	0.10	-
122	Lead	0.50	0.20	0.20	-
124	Nickel	0.50	0.10	0.10	-
128	Zinc	0.50	0.25	0.25	-
130	Xylene	1.5	1.5	0.05	-

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(1) Costs are all power unless otherwise noted.
(2) Values are all in mg/l unless otherwise noted.
*: Lower levels of organics can be achieved at BAT-1 by oil solution substitution (see Section X).

KEY TO C&TT STEPS

I: Filtration
J: Granular Carbon Columns
K: Evaporation
L: Recycle

TABLE VIII-14

ALTERNATIVE BAT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling-Combination
: Carbon-Specialty

Model Size-TPD : 4400
Oper. Days/Year: 348
Turns/Day : 3

Alternative C&TT Steps	1		2			3		
	I	Total	I	J	Total	K	L	Total
Investment $ x 10^{-3}	539	539	539	2,918	3,457	10,183	267	10,450
Annual Cost $ x 10^{-3}								
Capital	23.2	23.2	23.2	125.5	148.7	437.9	11.5	449.4
Depreciation	53.9	53.9	53.9	291.8	345.7	1018.3	26.7	1045.0
Operation & Maintenance	18.9	18.9	18.9	102.1	121.0	356.4	9.3	365.7
Energy & Power$^{(1)}$	8.1	8.1	8.1	38.9	47.0	861.5	6.2	867.7
Carbon Regeneration	-	-	-	717.4	717.4	-	-	-
TOTAL	104.1	104.1	104.1	1275.7	1379.8	2674.1	53.7	2727.8

	Effluent Quality$^{(2)}$	BAT Feed Level	BAT No. 1 Effluent Level*	BAT No. 2 Effluent Level	BAT No. 3 Effluent Level
	Flow, gal/ton	250	250	250	0
	Suspended Solids	25	15	15	-
	Oil & Grease	10	5	5	-
	Dissolved Iron	1.0	1.0	1.0	-
	pH, Units	6-9	6-9	6-9	-
6	Carbon Tetrachloride	0.02	0.02	0.02	-
11	1,1,1-Trichloroethane	0.08	0.08	0.08	-
23	Chloroform	0.10	0.10	0.02	-
24	2-Chlorophenol	3.00	3.00	0.05	-
34	2,4-Dimethylphenol	2.00	2.00	0.05	-
38	Ethylbenzene	0.03	0.03	0.03	-
55	Naphthalene	0.02	0.02	0.02	-
57	2-Nitrophenol	6.0	6.0	0.05	-
60	4,6-Dinitro-o-cresol	0.10	0.025	0.025	-

TABLE VIII-14
ALTERNATIVE BAT MODEL COSTS: BASIS 7/1/78 DOLLARS
COLD ROLLING - COMBINATION
PAGE 2

65	Phenol	0.10	0.10	0.05	-
78	Anthracene	0.01	0.01	0.01	-
80	Fluorene	0.01	0.01	0.01	-
85	Tetrachloroethylene	0.15	0.05	0.05	-
86	Toluene	0.02	0.02	0.02	-
87	Trichloroethylene	0.02	0.02	0.02	-
114	Antimony	0.02	0.02	0.02	-
115	Arsenic	0.10	0.10	0.10	-
118	Cadmium	0.08	0.08	0.08	-
119	Chromium	0.50	0.10	0.10	-
120	Copper	0.50	0.10	0.10	-
122	Lead	0.50	0.20	0.20	-
124	Nickel	0.50	0.10	0.10	-
128	Zinc	0.50	0.25	0.25	-
130	Xylene	0.35	0.35	0.05	-

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.
*: Lower levels of organics can be achieved at BAT-1 by oil solution substitution (see Section X).

KEY TO C&TT STEPS

I: Filtration
J: Granular Carbon Columns
K: Evaporation
L: Recycle

TABLE VIII-15

ALTERNATIVE BAT MODEL COSTS: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling-Direct Application
: Carbon-Specialty

Model Size-TPD : 2900
Oper. Days/Year: 348
Turns/Day : 3

Alternative C&TT Steps	1		2			3		
	I	Total	I	J	Total	K	L	Total
Investment $ x 10^{-3}	540	540	540	3011	3551	10183	267	10450
Annual Cost $ x 10^{-3}								
Capital	23.2	23.2	23.2	129.5	152.7	437.9	11.5	449.4
Depreciation	54.0	54.0	54.0	301.1	355.1	1018.3	26.7	1045.0
Operation & Maintenance	18.9	18.9	18.9	105.4	124.3	356.4	9.3	365.7
Energy & Power(1)	8.1	8.1	8.1	38.9	47.0	908.7	6.2	914.9
Carbon Regeneration	-	-	-	740.0	740.0	-	-	-
TOTAL	104.2	104.2	104.2	1314.9	1419.1	2721.3	53.7	2775.0

Effluent Quality(2)	BAT Feed Level	BAT No. 1 Effluent Level	BAT No. 2 Effluent Level	BAT No. 3 Effluent Level
Flow, gal/ton	400	400	400	0
Suspended Solids	25	15	15	-
Oil & Grease	10	5	5	-
Dissolved Iron	1.0	1.0	1.0	-
pH, Units	6-9	6-9	6-9	-
4 Benzene	0.01	0.01	0.01	-
6 Carbon Tetrachloride	0.01	0.01	0.01	-
11 1,1,1-Trichloroethane	0.05	0.05	0.05	-
78 Anthracene	0.03	0.03	0.03	-
85 Tetrachloroethylene	0.03	0.03	0.03	-
115 Arsenic	0.02	0.02	0.02	-
117 Beryllium	0.01	0.01	0.01	-
119 Chromium	0.10	0.10	0.10	-
120 Copper	0.15	0.10	0.10	-
122 Lead	0.40	0.20	0.20	-
124 Nickel	0.30	0.10	0.10	-
128 Zinc	0.15	0.15	0.15	-

---

(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

J:	Filtration	K:	Evaporation
J:	Granular Carbon Columns	L:	Recycle

TABLE VIII-16

RESULTS OF BCT COST TEST
COLD ROLLING

A. Recirculation Type

BCT: lbs/year removed = 1872
Cost of BCT = $24,000 $/lb = 12.82 FAIL

B. Combination Type

BCT: lbs/year removed = 114,932
Cost of BCT = $104,100 $/lb = 0.91 PASS

C. Direct Application Type

BCT: lbs/year removed = 227,251
Cost of BCT = $104,200 $/lb = 0.46 PASS

TABLE VIII-17

NSPS and PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Rolling
: Recirculation
: Carbon-Specialty

Model Size-TPD : 1700
Oper. Days/Year: 348
Turns/Day : 3

	Alternative 1											2-Alt. No.1 plus:	
C&TT Step	A	B	C(2)	D(2)	E(2)	F	G	H(3)	I(3)	J	Total	K	Total (Incl. A-J)
Investment $ x 10^{-3}	25	27	65	60	66	61	59	15	47	107	532	515	1047
Annual Cost $ x 10^{-3}													
Capital	1.1	1.1	2.8	2.6	2.8	2.6	2.6	0.6	2.0	4.6	22.8	22.1	44.9
Depreciation	2.5	2.7	6.5	6.0	6.6	6.1	5.9	1.5	4.7	10.7	53.2	51.5	104.7
Operation and Maintenance	0.9	0.9	2.3	2.1	2.3	2.1	2.1	0.5	1.7	3.8	18.7	18.0	36.7
Sludge Disposal	-	-	-	-	-	-	-	-	0.1	-	0.1	-	0.1
Energy and Power(1)	-	-	0.3	0.2	0.5	0.3	0.6	-	0.9	0.3	3.1	1.6	4.7
Chemical Costs	-	-	0.3	0.1	0.2	0.4	-	-	-	-	1.0	-	1.0
Oil Disposal	5.0	-	-	-	-	-	-	-	-	-	5.0	-	5.0
Carbon Regeneration	-	-	-	-	-	-	-	-	-	-	-	96.0	96.0
TOTAL	9.4	4.7	12.2	11.0	12.4	11.5	11.2	2.6	9.4	19.4	103.9	189.2	293.1

	Effluent Quality(4)	Raw Waste Level	NSPS and PSNS No.1 Effluent Level	NSPS and PSNS No.2 Effluent Level
	Flow, gal/ton	10	10	10
	Suspended Solids	2,500	15	15
	Oil and Grease	50,000	5	5
	Dissolved Iron	250	1	1
	pH (Units)	6-9	6-9	6-9
6	Carbon Tetrachloride	0.05	0.05	0.05
11	1,1,1-Trichloroethane	0.25	0.25	0.10
23	Chloroform	0.25	0.25	0.02
24	Chlorophenol	15.00	15.00	0.05
34	2,4-Dimethylphenol	10.50	10.50	0.05
38	Ethylbenzene	0.20	0.20	0.05

TABLE VIII-17
NSPS and PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
COLD ROLLING
PAGE 2

	Effluent Quality(4)	Raw Waste Level	NSPS and PSNS No.1 Effluent Level	NSPS and PSNS No.2 Effluent Level
55	Naphthalene	0.25	0.05	0.025
57	2-Nitrophenol	30.00	30.00	0.05
60	4,6-Dinitro-o-cresol	0.50	0.025	0.025
65	Phenol	0.08	0.08	0.05
78	Anthracene	7.50	0.01	0.01
80	Fluorene	0.08	0.01	0.01
85	Tetrachloroethylene	0.80	0.05	0.05
86	Toluene	0.10	0.10	0.02
87	Trichloroethylene	0.08	0.08	0.08
114	Antimony	0.20	0.10	0.10
115	Arsenic	0.80	0.10	0.10
118	Cadmium	0.25	0.10	0.10
119	Chromium	5.0	0.10	0.10
120	Copper	10.5	0.10	0.10
122	Lead	6.8	0.20	0.20
124	Nickel	5.5	0.10	0.10
128	Zinc	5.0	0.25	0.25
130	Xylene	3.8	3.8	0.05

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(1) Costs are all power unless otherwise noted.
(2)(3) Treatment components are used in tandem
(4) All values are in mg/l unless otherwise noted

KEY TO C&TT STEPS

A: Oil Separator
B: Equalization tank
C: Alum addition
D: Neutralization w/acid
E: Flocculation w/lime

F: Polymer addition
G: Air flotation
H: Settling basin
I: Vacuum filter
J: Mixed-media presure filter
K: Granular carbon column unit

TABLE VIII-18

PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Cold Forming		
:	Cold Rolling	Model Size-TPD :	1700
:	Recirculation	Oper. Days/Year:	348
:	Carbon/Specialty	Turns/Day :	3

Alternative	Alternative 1											Alternative 2	
C&TT Step	A	B	C(2)	D(2)	E(2)	F	G	H(3)	I(3)	J	Total	K	Total (Includes A-J)
Investment \$ x 10^{-3}	43	49	81	76	83	78	72	18	46	132	678	893	1571
Annual Cost \$ x 10^{-3}													
Capital	1.8	2.1	3.5	3.3	3.5	3.3	3.1	0.8	2.0	5.7	29.2	38.4	67.6
Depreciation	4.3	4.9	8.1	7.6	8.3	7.8	7.2	1.8	4.6	13.2	67.8	89.3	157.1
Operation and Maintenance	1.5	1.7	2.8	2.6	2.9	2.7	2.5	0.6	1.6	4.6	23.7	31.2	54.7
Sludge Disposal	-	-	-	-	-	-	-	-	0.3	-	0.3	-	0.3
Energy and Power(1)	-	-	0.3	0.2	0.5	0.5	1.2	-	1.1	0.5	4.3	3.1	7.4
Chemical Costs	-	-	0.4	0.4	0.5	1.3	-	-	-	-	3.1	-	3.1
Oil Disposal	0.8	-	-	-	-	-	-	-	-	-	0.8	-	0.8
Carbon Regeneration	-	-	-	-	-	-	-	-	-	-	-	167.0	167.0
TOTAL	8.4	8.7	15.6	14.1	15.8	15.6	14.0	3.2	9.6	24.0	129	329.0	458.0

	Effluent Quality(4)	PSES Feed Level	PSES No.1 Effluent Level	PSES No.2 Effluent Level
	Flow, gal/ton	25	25	25
	Suspended Solids	1000	15	15
	Oil & Grease	20,000	5	5
	Dissolved Iron	100	1.0	1.0
	pH (Units)	6-9	6-9	6-9
6	Carbon Tetrachloride	0.02	0.02	0.02
11	1,1,1-Trichloroethane	0.10	0.10	0.10
23	Chloroform	0.10	0.10	0.02
24	2-Chlorophenol	6.00	6.00	0.05
34	2,4-Dimethylphenol	4.20	4.20	0.05
38	Ethylbenzene	0.07	0.05	0.05
55	Naphthalene	0.09	0.05	0.025
57	2-Nitrophenol	12.00	12.00	0.05
60	4,6-Dinitro-o-cresol	0.20	0.025	0.025
65	Phenol	0.02	0.02	0.02
78	Anthracene	3.0	0.01	0.01
80	Fluorene	0.03	0.01	0.01
85	Tetrachloroethylene	0.30	0.05	0.05
86	Toluene	0.04	0.04	0.02
87	Trichloroethylene	0.03	0.03	0.03

TABLE VIII-18
PRETREATMENT MODEL COST DATA: BASIS 7/1/78 DOLLARS
SUBCATEGORY: COLD ROLLING - RECIRCULATION
PAGE 2

Effluent Quality(4)	PSES Feed Level	PSES No.1 Effluent Level	PSES No.2 Effluent Level
114 Antimony	0.03	0.03	0.03
115 Arsenic	0.30	0.10	0.10
118 Cadmium	0.10	0.10	0.10
119 Chromium	2.0	0.10	0.10
120 Copper	4.2	0.10	0.10
122 Lead	2.7	0.20	0.20
124 Nickel	2.2	0.10	0.10
128 Zinc	2.0	0.25	0.25
130 Xylene	1.50	1.5	0.05

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(1) Costs are all power unless otherwise noted.
(2),(3) Treatment components are used in tandem.
(4) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Oil Separation
B: Equalization
C: Alum Addition
D: Neutralization w/acid
E: Flocculation w/lime
F: Polymer Addition
G: Air Flotation
H: Settling Basin
I: Vacuum Filter
J: Filtration
K: Granular Carbon Column Unit

TABLE VIII-19

PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Cold Forming		
	Cold Rolling	Model Size-TPD :	4400
:	Combination	Oper. Days/Year:	348
:	Carbon/Specialty	Turns/Day :	3

Alternative	Alternative 1											Alternative 2	
C&TT Step	A	B	C(2)	D(2)	E	F	G(3)	H(3)	I	J	Total	K	Total (Includes A-J)
Investment $ x 10^{-3}	82	227	170	121	226	154	154	155	98	539	1926	2918	4844
Annual Cost $ x 10^{-3}													
Capital	3.4	9.8	7.3	5.2	9.7	6.6	6.6	6.7	4.2	23.2	82.8	125.5	208.3
Depreciation	8.2	22.7	17.0	12.1	22.6	15.4	15.4	15.5	9.8	53.9	192.6	291.8	484.4
Operation & Maintenance	2.9	7.9	5.9	4.2	7.9	5.4	5.4	5.4	3.4	18.9	67.3	102.1	169.4
Sludge Disposal	-	-	-	-	-	-	-	7.8	0.8	-	8.6	-	8.6
Energy and Power(1)	-	-	4.5	3.6	4.2	3.9	5.5	-	1.7	8.1	31.5	38.9	70.4
Chemical Costs	-	-	22.4	8.5	11.2	28.8	-	-	-	-	70.9	-	70.9
Oil Disposal	31.6	-	-	-	-	-	-	-	-	-	31.6	-	31.6
Carbon Regeneration	-	-	-	-	-	-	-	-	-	-	-	717.4	717.4
TOTAL	46.2	40.4	57.1	33.6	55.6	60.1	32.9	35.4	19.9	104.1	485.3	1275.7	1761.0

	Effluent Quality(4)	PSES Feed Level	PSES-1 Effluent Level	PSES-2 Effluent Level
	Flow, gal/ton	250	250	250
	Suspended Solids	600	15	15
	Oil & Grease	1000	5	5
	Dissolved Iron	10	1.0	1.0
	pH, Units	6-9	6-9	6-9
6	Carbon Tetrachloride	0.02	0.02	0.02
11	1,1,1-Trichloroethane	0.10	0.08	0.08
23	Chloroform	0.15	0.10	0.02
24	2-Chlorophenol	3.00	3.00	0.05
34	2,4-Dimethylphenol	2.00	2.00	0.05
38	Ethylbenzene	0.03	0.03	0.03

TABLE VIII-19
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Effluent Quality(4)		PSES Feed Level	PSES-1 Effluent Level	PSES-2 Effluent Level
55	Naphthalene	0.02	0.02	0.02
57	2-Nitrophenol	6.00	6.00	0.05
60	4,6-Dinitro-o-cresol	0.10	0.025	0.025
65	Phenol	0.10	0.10	0.05
78	Anthracene	0.20	0.01	0.01
80	Fluorene	0.01	0.01	0.01
85	Tetrachloroethylene	0.15	0.05	0.05
86	Toluene	0.02	0.02	0.02
87	Trichloroethylene	0.02	0.02	0.02
114	Antimony	0.02	0.02	0.02
115	Arsenic	0.10	0.10	0.10
118	Cadmium	0.08	0.08	0.08
119	Chromium	1.00	0.10	0.10
120	Copper	2.00	0.10	0.10
122	Lead	1.50	0.20	0.20
124	Nickel	0.90	0.10	0.10
128	Zinc	0.90	0.25	0.25
130	Xylene	0.35	0.35	0.35

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(1) Costs are all power unless otherwise noted.
(2)(3) Treatment components are used in tandem.
(4) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Oil Separation
B: Equalization
C: Alum Addition
D: Neutralization w/Acid
E: Flocculation w/Lime
F: Polymer Addition
G: Air Flotation
H: Settling Basin
I: Vacuum Filter
J: Filtration
K: Granular Carbon Column Unit

TABLE VIII-20

PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
Cold Rolling
: Direct Application
: Carbon/Specialty

Model Size-TPD : 2900
Oper. Days/Year: 348
Turns/Day : 3

Alternative	Alternative 1											Alternative 2	
C&TT Step	A	B	C(2)	D(2)	E	F	G(3)	H(3)	I	J	Total	K	Total (Includes A-J)
Investment $ x 10^{-3}	86	238	170	122	227	154	154	171	101	540	1963	3011	4974
Annual Cost $ x 10^{-3}													
Capital	3.7	10.3	7.3	5.2	9.8	6.6	6.6	7.3	4.4	23.2	84.4	129.5	213.9
Depreciation	8.6	23.8	17.0	12.2	22.7	15.4	15.4	17.1	10.1	54.0	196.3	301.1	497.4
Operation & Maintenance	3.0	8.3	5.9	4.3	7.9	5.4	5.4	6.0	3.6	18.9	68.7	105.4	174.1
Sludge Disposal	-	-	-	-	-	-	-	4.9	0.8	-	5.7	-	5.7
Energy and Power(1)	-	-	2.6	2.3	4.0	3.9	5.5	-	1.7	8.1	28.1	38.9	67.0
Chemical Costs	-	-	23.6	8.9	11.8	30.1	-	-	-	-	74.4	-	74.4
Oil Disposal	50.2	-	-	-	-	-	-	-	-	-	50.2	-	50.2
Carbon Regeneration	-	-	-	-	-	-	-	-	-	-	-	740.0	740.0
TOTAL	65.5	42.4	56.4	32.9	56.2	61.4	32.9	35.3	20.6	104.2	507.8	1314.9	1822.7

	Effluent Quality(4)	PSES Feed Level	PSES-1 Effluent Level	PSES-2 Effluent Level
	Flow, gal/ton	400	400	400
	Suspended Solids	100	15	15
	Oil & Grease	1025	5	5
	Dissolved Iron	25	1.0	1.0
	pH, Units	6-9	6-9	6-9
4	Benzene	0.01	0.01	0.01
6	Carbon Tetrachloride	0.01	0.01	0.01
11	1,1,1-Trichloroethane	0.05	0.05	0.05
78	Anthracene	0.03	0.03	0.03
85	Tetrachloroethylene	0.03	0.03	0.03

TABLE VIII-20
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Effluent Quality(4)	PSES Feed Level	PSES-1 Effluent Level	PSES-2 Effluent Level
115 Arsenic	0.02	0.02	0.02
117 Beryllium	0.01	0.01	0.01
119 Chromium	0.10	0.10	0.10
120 Copper	0.16	0.10	0.10
122 Lead	0.40	0.20	0.20
124 Nickel	0.30	0.10	0.10
128 Zinc	0.15	0.15	0.15

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(1) Costs are all power unless otherwise noted.
(2)(3) Treatment components are used in tandem.
(4) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Oil Separation
B: Equalization
C: Alum Addition
D: Neutralization w/Acid
E: Flocculation w/Lime

F: Polymer Addition
G: Air Flotation
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J: Filtration
K: Granular Carbon Column Unit

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

The Agency is proposing Best Practicable Control Technology Currently Available (BPT) limitations which are the same as those originally promulgated in March, 1976. As previous documents explain the methods used to develop the originally promulgated guidelines, the intent of this section is to further subtantiate these limitations. Some of the proposed limitations are justified only by one of the plants visited during the sampling trips because either some of the mills sampled had inadequate treatment or representative samples of the treatment plant effluents could not be taken. In these instances, additional justification of the limitations is provided by demonstrating that the flow and concentrations used to develop the proposed BPT limitations are justified. A review of the treatment processes and effluent limitations associated with the cold rolling subdivision follows.

Identification of BPT

The BPT model treatment system is identical to the model used in the previous regulation. This system involves the treatment of either once-through (DA mills) or recirculated (recirculation and combination mills) wastewater by oil separation and equalization; chemical addition (alum and acid) to break any oil emulsions; flocculation with polymer and neutralization; air flotation; and, settling.

Figure IX-1 depicts the BPT model treatment described above for cold rolling operations. Few plants in the subcategory employ the exact treatment configuration outlined above. The system was developed based upon general practices within the category and is an efficient way to treat cold rolling wastewaters. The proposed BPT effluent limitations for the three types of cold rolling operations, which represent 30-day average values, are presented in Table IX-1. Maximum values are three times the average values.

Rationale for BPT

Treatment System

As noted in Sections III and VII, each of the treatment system components incorporated in the BPT model treatment system is in use at a number of cold rolling operations. On the basis of widespread use, the use of each model treatment system component is demonstrated.

Justification of Proposed BPT Limitations

Table IX-2 presents sampled plant effluent data which support the proposed limitations for the three types of cold rolling operations. The only limitation not justified by the data is the dissolved iron limit for direct application mills. The ability to achieve the dissolved iron limit is well substantiated by other cold rolling plants which practice adequate neutralization and sedimentation.

The Agency believes that other plants which do not achieve the proposed limitations have inadequate treatment. This conclusion is based upon the fact that many cold rolling plants have reported flows less than the model flow and because several treatment technologies, including the model treatment system, can achieve the model concentrations. The plants achieving the BPT flows are shown in Tables X-4 through X-6. Data presented in Volume I detail the capabilities of the treatment components used in the model treatment system.

As noted earlier, the Agency believes that more stringent BPT limitations may be appropriate for the combination and direct application segment of the cold rolling subdivisions. Those more stringent limitations are based upon lower model flow rates of 250 gal/ton and 400 gal/ton, respectively, and the same model technology noted above. These more stringent limitations are as follows.

	Monthly Average (kg/kkg)	Daily Maximum (kg/kkg)
Combination		
TSS	0.0261	0.0783
Oil and Grease	0.0104	0.0312
Direct Application		
TSS	0.104	0.312
Oil and Grease	0.0417	0.125

The costs (in millions of July 1, 1978 dollars) to achieve these limitations are as follows.

	Model Plant		Segment Total	
	Capital	Annual	Capital	Annual
Combination	1.29	0.36	12.89	3.61
Direct Application	1.32	0.38	30.41	8.81

The above costs include all facilities in-place as of January 1, 1978 and are the same as those required to achieve the proposed BPT limitations.

TABLE IX-1

BPT EFFLUENT LIMITATION GUIDELINES
COLD ROLLING

	Effluent Limitation Guidelines (lbs/1000 lbs)[1]		
	Recirculation Mills	Combination Mills	Direct Application Mills
Discharge Flow Basis (gal/ton)*	25	400	1000
Total Suspended Solids	0.0026	0.0417	0.104
Oil & Grease	0.00104	0.0167	0.0417
Dissolved Iron[2]	0.00011	0.00167	0.0042
pH	6-9	6-9	6-9

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(1) Average limitations. Maximum limits are three times the values shown.
(2) Dissolved iron load is allowed only when the cold rolling wastewaters are treated with pickle rinse wastewaters.
*: Flow is not limited but has been used as a basis for the proposed limitations.

TABLE IX-2

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS COLD ROLLING

	Effluent Limitations in kg/kkg (lbs/1000 lbs)			
	TSS	O & G	D. Iron[(1)]	C&TT
A. Recirculation Mills				
Proposed BPT Effluent Limitations	0.00261	0.00104	0.000104	E, SS, NA, FLP, EB, SL
Actual Loads				
BB-2 (060B)	0.00013	0.00040	0.0000026	EB, T, FLP, NL, CL, SS, VF
EE-2 (0112D)	0.00015	0.00029	0.0000014	FLP, NL, NW, CL, SL, SS
X-2 (060)	0.0015	0.00030	0.0000073	EB, GF, CL, SS
B. Combination Mills				
Proposed BPT Effluent Limitations	0.0417	0.0167	0.00167	E, SS, NA, FLP, EB, SL
DD-2 (584E-01)	0.0128	*	0.000085	NA, FLP, SL
YY-2 (432D-01)	0.00921	0.00345	NA	NA, FLP, SL
C. Direct Application Mills				
Proposed BPT Effluent Limitations	0.104	0.0417	0.00417	E, SS, NA, FLP, EB, SL
106 (0112B)	0.00039	0.0027	NA	E, SS, FSP, NW, T

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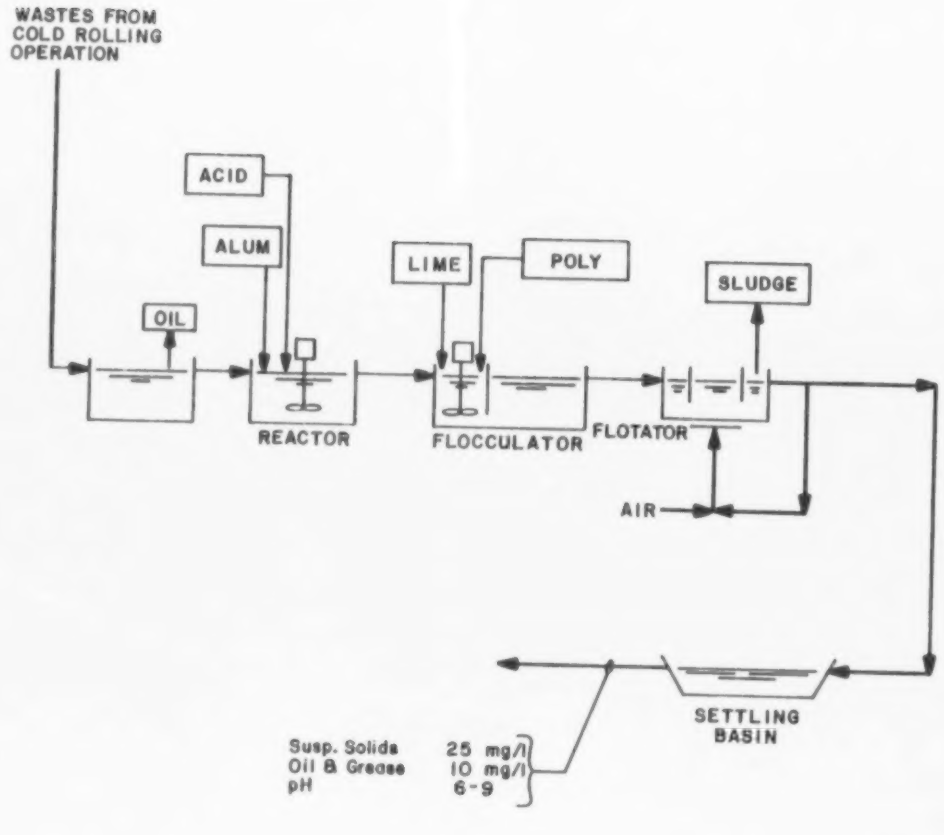
* : Load not justified
NA: Not analyzed



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
BPT MODEL

Dwn.7/9/80

FIGURE IX-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

This section identifies three BAT alternative treatment systems, and the resulting effluent levels considered for the cold rolling subdivision. In addition, the rationale for the selection of treatment technologies, their discharge flow rates, and the proposed limitations are presented. Previously, the three types of cold rolling mills (recirculation, combination, and direct application) were discussed individually. Here, the BAT alternative treatment technologies apply to all three types. Finally, there is a discussion of the selection of a BAT model treatment system which serves as the basis for the proposed BAT limitations.

Identification of BAT

Based upon the information contained in Sections III through VIII, the Agency developed the following treatment technologies (as add-ons to the BPT treatment system model) as BAT alternative treatment systems in the cold rolling subdivison.

1. BAT Alternative No. 1

   The first BAT Alternative employs a mixed-media filter following BPT treatment. Filtration of the BPT discharge removes toxic metal pollutants in the particulate form, solids, and oils that may entrain toxic organic pollutants.

2. BAT Alternative No. 2

   This alternative employs carbon columns following the filtration step outlined above to reduce toxic organic pollutants present in the filtered discharge.

3. BAT Alternative No. 3

   Alternative No. 3 is a zero discharge system which treats the BPT discharge in a vapor compression evaporation system.

Figure X-1 illustrates the three BAT alternative treatment systems described above for the cold rolling subdivision. The treatment technologies shown represent those technologies in use at one or more plants, or demonstrated in other wastewater treatment applications. These systems are capable of attaining the respective BAT effluent levels. The applicability of each treatment method is reviewed below. Tables X-1 through X-3 contain effluent limitations associated with the three BAT Alternatives. Section VI presents the general rationale for the selection of the toxic pollutants for which BAT limitations are proposed. More details on why the Agency is proposing limitations for specific pollutants at BAT are provided below.

Investment and annual costs for the BAT alternative treatment systems are presented in Tables VIII-13 through VIII-15.

Rationale for the Selection of the BAT Alternatives

This discussion presents the rationale for selecting the BAT model treatment system, for determining the effluent flow rates, selecting the list of pollutants to be limited, and determining the concentration levels of the limited pollutants.

Treatment Technologies

To reduce the levels of particulate toxic metal and toxic organic pollutants entrained in the oils, a mixed-media filtration system is included in Alternative No. 1. Although this alternative does not significantly remove the toxic organic pollutants present, it significantly reduces the pollutant load of conventional and toxic inorganic pollutants being discharged from the cold rolling operations.

Four plants have filtration systems which treat cold rolling mill wastewaters, one of which has been sampled. At this plant, the filtration step was used as an intermediate treatment step with the filter discharge receiving additional treatment in a thickener. The oil and solids concentrations entering the filter were extremely high, which greatly affected the efficiency of the filter. Therefore, the effluent data from this mill are not comparable to other well operated filter systems sampled for this study, and have not been used in support of the proposed limitations. The levels achieved with filtration are based upon the performance of filter systems in other subcategories. Refer to Volume I for more details.

Alternative No. 2 uses granular activated carbon following the mixed-media filtration system described above. The carbon system was selected for removal of toxic organic pollutants based upon performance of activated carbon systems on similar wastewaters.

Although fifteen organic pollutants have been found in raw cold mill wastes (some at levels above 10 mg/l), at present, no carbon systems are installed at any cold rolling mills. However, because activated carbon is used to treat wastes in the cokemaking subcategory and in other industrial categories with similar organic contamination, activated carbon is expected to work effectively for cold rolling wastes.

Alternative No. 3 makes use of a vapor compression evaporation system, as it is one of the less costly of the evaporation systems available. However, it is energy intensive and expensive to operate. This system was considered since it may be the only technically feasible way to achieve zero discharge at all cold rolling operations..

Flows

The Agency developed the alternative treatment system flows recognizing the three types of cold rolling mills (recirculation, combination, and direct application). These flows were based upon data gathered from cold rolling mills in response to DCPs or during sampling visits. Tables X-4 through X-6 list the mills in operation and their respective discharge flows. The treatment system discharge flows are based upon the average of the best flows. For recirculation mills, the proposed flow rate is the same as for BPT - 25 GPT, even though the flow analysis demonstrates that a lower flow value for BAT limitations might be justified. Flow rates of 250 GPT and 400 GPT are being used for combination and direct application mills, respectively. These flows are less than BPT model system flows and can be achieved as demonstrated in Tables X-4 to X-6. Based upon available information, the Agency believes that product quality considerations do not restrict the ability of the industry to achieve these flows.

Wastewater Quality

Following are the average effluent concentrations incorporated in each BAT alternative. The maximum values appear below enclosed in parentheses.

	BAT Concentration Bases (mg/l)		
	BAT-1	BAT-2	BAT-3
1,1,1-Trichloroethane	-	0.10(0.30)[1]	-
2-Nitrophenol	-	0.025(0.075)[1]	-
Anthracene	-	0.01(0.03)[1]	-
Tetrachloroethylene	-	0.05(0.15)[1]	-
Chromium	0.1(0.3)	0.1(0.3)	-
Lead	0.1(0.3)	0.1(0.3)	-
Zinc	0.1(0.3)	0.1(0.3)	-

[1] Not limited for direct application operations.

No effluent concentrations are presented for BAT-3, since this alternative results in zero discharge.

Listed below is the rationale for the selection of the pollutants limited at BAT and their respective treatment levels.

Toxic Organic and Inorganic Pollutants

Fifteen toxic organic pollutants and nine toxic inorganic pollutants were detected in the raw and treated wastewater from cold rolling operations at treatable levels. For this reason, the Agency developed BAT alternative treatment systems which were designed primarily to reduce the levels of these pollutants.

Alternative No. 1 is designed to remove particulate metals and organics that may be entrained in oils. However, when highly contaminated oils (oils with high levels of toxic organics) are used in cold rolling mills, filtration will most likely not be effective in achieving the toxic organic effluent limitations proposed for those cases. The Agency believes the least costly method of complying with the proposed limitations is to change the rolling oil solutions to those that do not contain toxic organic pollutants. Based upon data obtained during this study (Plant 0248B), the Agency believes that such solutions are available and in use in the steel industry. Little or no capital costs are associated with an oil solution change. In the event a change in oil solutions is not the selection means of compliance, other technologies, such as those outlined in Alternative 2, can be employed to achieve the proposed limitations. Reference is made to Section VI of Volume I for a review of the performance of activated carbon for removing toxic organic pollutants.

Although nine inorganic toxic pollutants were found in the wastewaters from cold rolling operations, the Agency is proposing limitations for only three: chromium, lead, and zinc. The Agency is proposing limitations for these pollutants for three reasons. First, these pollutants were found in the highest levels. Second, these pollutants serve as "indicators" for the other metals that can be present in the wastewaters. The data show that removal of these metals to low levels also insures that all other metals will be reduced to low levels. And finally, limitations for these metals are also being proposed in the pickling subcategory. Since, as noted previously, cold rolling wastes can be co-treated with pickling wastes, the Agency has decided to develop a common list of limited pollutants so that those operations that chose to co-treat compatible wastes can do so without incurring extra costs.

Alternative No. 2 consists of filtration and carbon adsorption. This system is also effective at reducing metals, oils, and solids. However, it is designed primarily to reduce organic contamination in the wastewaters. Because cold rolling wastes contain a number of organic pollutants that are unaffected by the BPT model treatment system, activated carbon was considered as an alternative.

As shown above, limitations for four specific organics are being considered for proposal at cold rolling operations. These four pollutants were selected because they were: (1) found at high levels at the sampled plants, (2) found at more than one plant, and (3) limiting these four pollutants will insure removal of the other organics that may be discharged due to the nature of the oil solutions used.

The Agency attempted to find one or two general indicator pollutants which would properly serve as representative limited pollutants for the organics in this subdivision. Oil and grease will serve as an indicator for some of the insoluble organics, but not all of the pollutants of concern. Phenolic compounds, an indicator used in other subcategories, could not be used here, since it would serve as an indicator for only a few of the pollutants detected and because it was not found at high enough levels consistently to correlate its removals to removals of other pollutants. For these reasons, limits for four specific toxic organics are being proposed.

Lastly, Alternative No. 3 includes a zero discharge system.

Effluent Limitations for Alternative Treatment Systems

The effluent limitations associated with BAT alternative treatment systems were calculated by multiplying the effluent flows incorporated in the alternative treatment systems by the concentration of each pollutant and an appropriate conversion factor. Tables X-1 through X-3 present the effluent limitations developed for each BAT alternative treatment system.

Selection of a BAT Alternative

The Agency selected BAT Alternative No. 1 as the BAT model treatment system upon which the proposed BAT effluent limitations are based. All of the treatment alternatives achieve significant reductions in toxic pollutant loads. The Agency selected Alternative No. 1 since the components of this alternative are demonstrated within the subdivision and because it reduces pollutant loads at a relatively low cost. However, the Agency does not believe that Alternative No. 1 is sufficient to insure that the organic contamination present in cold rolling wastewaters will be reduced. Therefore, in addition to proposing limitations at BAT-1 for solids, oils, and metals, EPA is also proposing BAT-2 limitations for the four toxic organics described above for recirculation and combination mills. Since toxic organic pollutants were found below treatable levels in direct application wastewaters, no limitations for toxic organic pollutants are being proposed for this segment.

The Agency believes the proposed limitations can be met by any of three methods:

1. If a clean oil is used at a cold rolling mill (free from organic contamination), no additional treatment is required to achieve the proposed limitations.

2. If a "dirty" oil is used, a carbon adsorption system can be installed to reduce organic contamination.

3. If a "dirty" oil is used, change to a clean oil to remove the organic problem can be accomplished at virtually no capital expense. This issue is described in greater detail below.

Removal of Organic Contamination by Oil Substitution

As pointed out above, significant levels of numerous organic pollutants were detected in cold rolling wastewaters during the sampling visits. These organics result in the wastewater because of the oil solutions used at the rolling stands. These rolling oils are specially formulated oils that provide high degrees of lubricating and cooling. The data gathered during the sampling visits demonstrate that this organic contamination is not widespread throughout the category. Some mills, because of the oil solutions used, do not have any organic contamination. Furthermore, the sampling visits have shown that oil solutions may be substituted, sometimes using "clean" oils and other times using "dirty" or contaminated solutions. For these reasons, the Agency has considered as an alternative to installing treatment to meet organic limits, a simple substitution of oil solutions where necessary. There are evidently several oils used in the subdivision that do not contain toxic organic pollutants.

To summarize, the Agency is proposing BAT-2 effluent limitations for recirculation and combination cold rolling operations. This alternative includes limitations for toxic metals and four toxic organic pollutants. The EPA estimates that the least costly method of achieving these limitations is to install BAT-1 technology and use oil solutions which are free from organic contamination. The cost impacts for this subdivision are based on the assumption that all operations will install BAT-1 technology.

Obviously, monitoring for at least the four toxic organics will be recommended for all cold rolling operations. This monitoring will show whether or not organic contamination is a problem. If organics are detected at levels above the proposed limitations, then the oil solution should be changed or treatment installed to reduce the contamination to below the proposed limits.

TABLE X-1

BAT EFFLUENT LIMITATION GUIDELINES
COLD ROLLING - RECIRCULATION

BAT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	1,1,1-Tri-(2) chloroethane (011)	2-Nitrophenol(2) (057)	Anthracene(2) (078)	Tetrachloro-(2) ethylene (085)	Chromium (119)	Lead (122)	Zinc (128)
Alternative 1	NL	NL	NL	NL	0.000010	0.000021	0.000026
Alternative 2*	0.000010	0.0000026	0.0000010	0.0000052	0.000010	0.000021	0.000026
Alternative 3	No discharge of process wastewater pollutants to navigable streams.						

---

(1) 30-day average limitations. Daily maximum values are twice the limitations stated.

(2) If a plant can demonstrate by sampling and analysis that its oil solutions do not contain these or other toxic organics at levels above their treatability level (see Volume I), then monitoring for these parameters can be suspended.

NL: No limitations
* : Limitations for Alternative No. 2 selected for BAT

TABLE X-2

BAT EFFLUENT LIMITATION GUIDELINES
COLD ROLLING - COMBINATION

BAT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	1,1,1-Tri-chloroethane(2) (011)	2-Nitrophenol(2) (057)	Anthracene(2) (078)	Tetrachloro-ethylene(2) (085)	Chromium (119)	Lead (122)	Zinc (128)
Alternative 1	NL	NL	NL	NL	0.00010	0.00021	0.00026
Alternative 2*	0.00010	0.000026	0.000010	0.000052	0.00010	0.00021	0.00026
Alternative 3	No discharge of process wastewater pollutants to navigable streams.						

---

(1) 30-day average limitations. Daily maximum values are twice the limitations stated (except for O & G).
(2) If a plant can demonstrate by sampling and analysis that its oil solutions do not contain these or other toxic organics at levels above their treatability level (see Volume I), then monitoring for these parameters can be suspended.
(3) Limitation for oil & grease is on a maximum basis only.

NL: No limitations
* : Limitations for Alternative No. 2 selected for BAT

TABLE X-3

BAT EFFLUENT LIMITATION GUIDELINES
COLD ROLLING - DIRECT APPLICATION

BAT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium (119)	Lead (122)	Zinc (128)
Alternative 1*	0.00017	0.00033	0.00042
Alternative 2	0.00017	0.00033	0.00042
Alternative 3	No discharges of process wastewater pollutants to navigable streams.		

---

(1) 30-day average limitations. Daily maximum values are twice the limitations stated (except for O & G).

* : Selected BAT alternative

TABLE X-4

BAT DISCHARGE FLOW DETERMINATION
COLD ROLLING - RECIRCULATION

Plant Code	Discharge Flow (GPT)	Basis
580C-04	0	DCP
580C-05	0	DCP
528-02	0.02	DCP
528-01	0.03	DCP
528-03	0.09	DCP
284A-01	0.1	DCP
580C-03	0.1	DCP
060-01	0.4	DCP
256A(01&02)	0.5	DCP
060-03	0.8	DCP
256B-01	0.8	DCP
856P(01-21)	0.8	DCP
060-02	0.9	DCP
176-08	0.9	Sampling Visit
584F(02,03&05)	1.1	Sampling Visit
320-02	1.9	DCP
112A-07	3.5	DCP
248B-03	3.5	Sampling Visit
684F-03	4.3	DCP
864B-01	5.1	DCP
684D(01-07)	5.7	DCP
864B-03	7.3	DCP
684F-02	8.7	DCP
384A-03	10.0	DCP
020B&020C	11.0	Sampling Visit
580C-01	12.5	DCP
580C-02	12.5	DCP
760-01	16.6	DCP
112D-01	17.5	Sampling Visit
60B-03	17.7	Sampling Visit

TABLE X-4
BAT DISCHARGE FLOW DETERMINATION
COLD ROLLING - RECIRCULATION
PAGE 2

Plant Code	Discharge Flow (GPT)	Basis
760-02	26.3	DCP
528B-01	30.2	DCP
384A-02	43.0	DCP
248B	57.0	Sampling Visit
684B-01	138.0*	DCP
864B-02	354.0*	DCP
860B-04	687.0*	DCP
684I-01	751.0*	DCP
860B-02	1,283.0*	DCP
948C-03	1,369.0*	DCP

Average of all discharge flow values = 114 gal/ton(1)
"Average of the Best" flow value = 9.0 gal/ton(1)
Use 25.0 gal/ton

---

(1) Includes flow data from three confidential operations.
*: Flow values marked with an asterisk were omitted from the "Average of the Best" flow calculation.

TABLE X-5

BAT DISCHARGE FLOW DETERMINATION
COLD ROLLING - COMBINATION

Plant Code	Discharge Flow (GPT)	Basis
868A-03	25	DCP
868A-01	54	DCP
856F-01	112	Sampling Visit
920C-01	114	DCP
584A-02	130	DCP
432D-01	138	Sampling Visit
856F-02	179	DCP
948C-02	293	DCP
860B-03	325	DCP
868A-02	481	DCP
584E-01	512	Sampling Visit
948C-01	870	DCP
948C-04	1,245*	DCP

Average of all flow values : 345 GPT
"Average of the Best" value: 268 GPT
use: 250 GPT

---

* Flow value marked with an aserisk were omitted from the "Average of the Best" flow calculation.

TABLE X-6

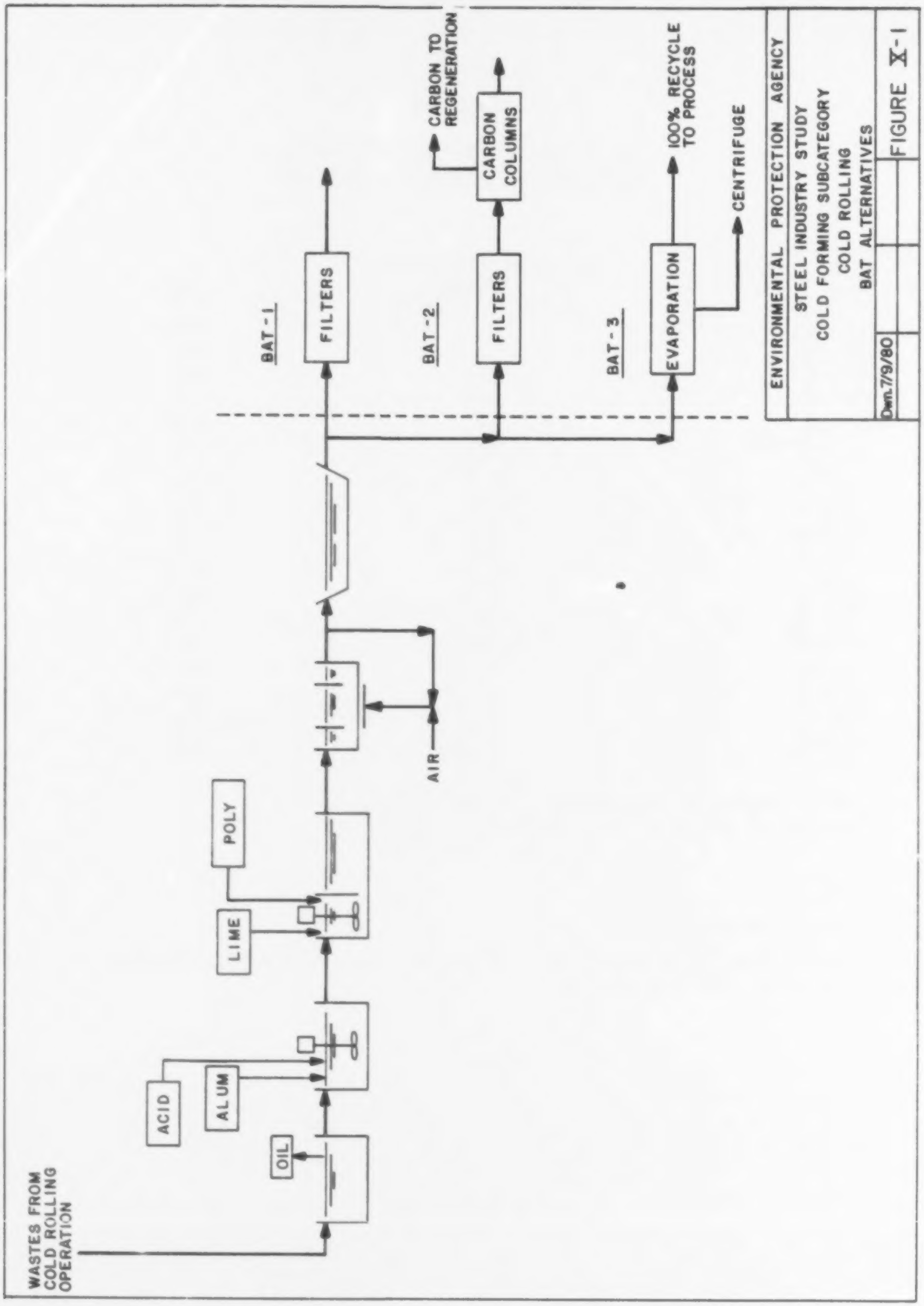
BAT DISCHARGE FLOW DETERMINATION
COLD ROLLING - DIRECT APPLICATION

Plant Code	Discharge Flow (GPT)	Basis
284A-02	0.5	DCP
684I-02	23	DCP
684C-02	142	DCP
860B-01	168	DCP
176-02	233	Sampling Visit
112B(01-06)	238	DCP
112A-02	246	DCP
384A-01	262	DCP
920A-01	273	DCP
856F-03	287	DCP
584F-04	424	Sampling Visit
112A-01	481	DCP
584A-01	603	DCP
112A-06	607	DCP
948A-02	864	DCP
948A-01	939	DCP
584C-01	1426*	DCP
920G-02	1477*	DCP
920G-01	1604*	DCP
112A-05	3081*	DCP

Average Discharge Flow Value = 669 GPT
"Average of the Best" Flow Value = 362 GPT
Use 400 GPT

---

* Flow values marked with an asterisk were omitted from the "Average of the Best" flow calculation.



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STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
BAT ALTERNATIVES

FIGURE X-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added Section 301(b)(4)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(g)(4) - BOD, TSS, fecal coliform and pH - and any additional pollutants defined by the Administrator as "conventional." On July 28, 1978, EPA proposed that COD, oil and grease, and phosphorus be added to the conventional pollutant list (43 Fed. Reg. 32857). Only oil and grease was added.

BCT is not an additional limitation, but replaces BAT for the control of conventional pollutants. BCT requires that limitations for conventinal pollutants be assessed in light of a new "cost-reasonbleness" test, which involves a comparison of the cost and level of reduction of conventional pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources. As part of its review of BAT for certain "secondary" industries, EPA proposed methodology for this cost test. (See 43 Fed. Reg. 37570, August 23, 1978).

Development of BCT

The reference POTW treatment cost for the conventional pollutants is $1.34/lb. The detailed results of the BCT Cost Test are presented in Section VIII, Table VIII-16. The Agency considered one alternative, filtration, as a BCT technology for the cold rolling segments. Figure XI-1 depicts this system. The model flows used for BCT are the same as those used for BAT. A summary of the results from the BCT cost test is presented below.

Mill Type	BCT Cost Test Results
Recirculation	12.82
Combination	0.91*
Direct Application	0.46*

* BCT limitations are proposed based on the application of this treatment.

As can be seen above, the treatment costs for combination and direct application type mills are less than $1.34/lb for the BCT system. The cost of removal for recirculation mills, on the other hand, exceeds the $1.34/lb treatment cost and thus fails the BCT Cost Test. Based on these results, the Agency is proposing BCT limitations for combination and direct application mills which are based upon the respective BCT treatment systems. The proposed BCT limitations for recirculation mills are the same as the proposed BPT limitations. The BCT limitations proposed for cold rolling are presented in Table XI-1.

Development of BCT Limitations

The Agency promulgated BPT limitations for suspended solids, oil and grease, and pH in 1976. The Agency is proposing BCT limitations for the same pollutants. Since the BCT alternative passed the BCT Cost Test for combination and direct application mills, the Agency is proposing BCT limitations for these operations based upon the application of BCT filtration technology. Following are the concentrations incorporated in the BCT limitations.

	Concentration Values (mg/l)	
	Ave	Max
Total Suspended Solids	15	40
Oil & Grease	-	10
pH, Units	6-9	

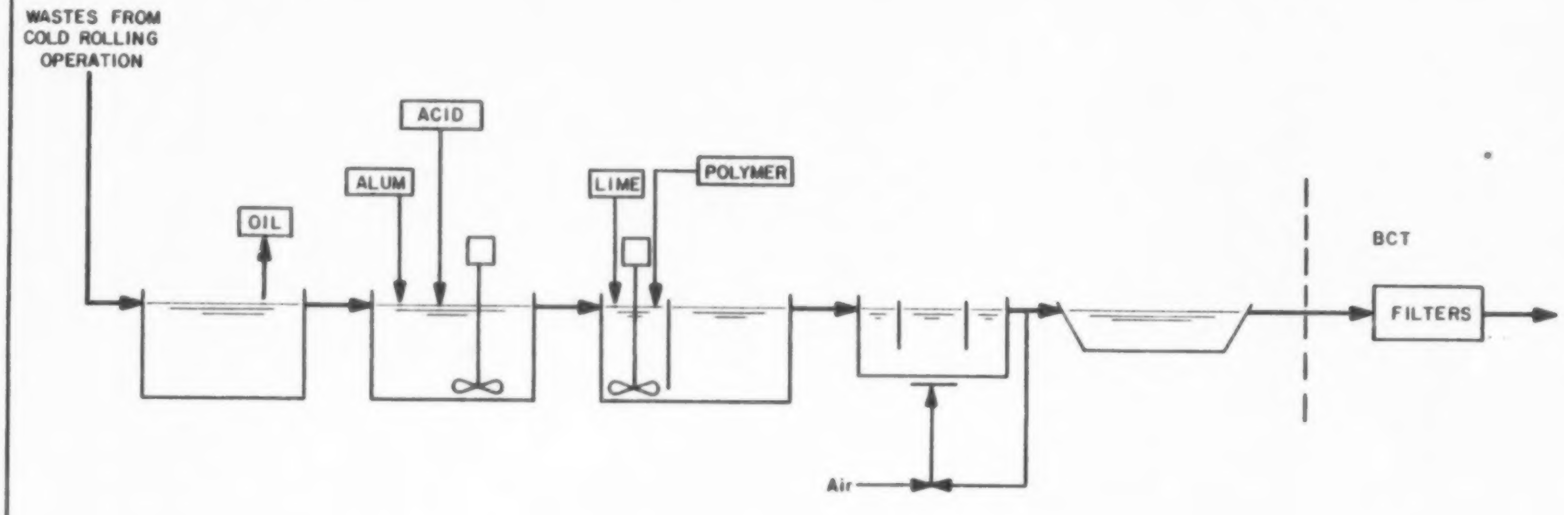
The effluent concentrations presented above are based on an analysis of long-term data available on numerous filtration applications in the steel industry. A detailed discussion of the derivation of these concentration values is presented in Volume I. BCT limitations for the combination and direct application mills were developed by multiplying these concentrations by the BCT flow values and the appropriate conversion factors. As noted above, BCT limitations for recirculation mills are identical to the proposed BPT limitations.

TABLE XI-1

BCT EFFLUENT LIMITATIONS
COLD ROLLING

Effluent Limitations in kg/kkg (lbs/1000 lbs)

	Suspended Solids		Oil & Grease		
	Ave	Max	Ave	Max	pH (Units)
Recirculation Mills	0.00260	0.00780	0.00104	0.00312	6-9
Combination Mills	0.0156	0.0312	-	0.0104	6-9
Direct Application Mills	0.0250	0.0500	-	0.0167	6-9



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STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
BCT MODEL

Dwn. 11/18/80

FIGURE XI-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

The effluent limitations which must be acheived by new sources, i.e., any sources, the construction of which is started after proposal of new source performance standards are to specify the degree of effluent reduction achievable through the application of the best available demonstrated control technology (BADCT) processes, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants. This section identifies the NSPS alternative treatment systems developed by the Agency and the resulting effluent levels for cold rolling operations. In addition, this section presents the rationale for selecting the NSPS model treatment system and the flow values and effluent standards.

The NSPS alternative treatment systems described below were developed for recirculation oil systems only. Discussions with industry representatives, mill manufacturers, and an analysis of the DCP responses indicate only recirculation type cold rolling mills are likely to be constructed as new sources. Recirculation systems are used on all types of steels and at mills that process all types of products and thicknesses. Although clean water can be required on the entry stand of some mills, the Agency believes that for new sources this water can be treated and reused, thus achieving the NSPS model flow.

Identification of NSPS

NSPS Alternative No. 1

Alternative No. 1 consists of an equalization basin equipped with an oil separator, chemical addition steps to break the oil emulsions, a flocculation tank and an air flotation system. These components are followed by a concrete settling basin and a mixed media filtration system. The effluent standards proposed for this alternative are listed in Table XII-1 and the system is diagrammed in Figure XII-1. The costs for this alternative were shown in Table VIII-17.

NSPS Alternative No. 2

Alternative No. 2 includes the components of Alternative No. 1 plus a granular carbon column system to reduce organic contamination, (Figure XII-1). The standards achieved with this alternative are also presented in Table XII-1.

The components employed in Alternative No. 2 were developed so as to achieve significant reductions in the toxic organic, toxic inorganic, and conventional pollutants. Although not all components are presently used in the cold rolling subdivision, their applicability to this subdivision was detailed earlier in Section X.

Rationale for Selection of NSPS

The NSPS alternative treatment systems for cold rolling operations are similar to the combined BPT, BAT-1, and BAT-2 treatment systems described in Sections IX and X, respectively. Hence, the detailed rationale presented in these sections is applicable to NSPS and is not repeated. A short discussion on the NSPS tretment systems and flow rates is presented below.

Treatment Scheme

As noted in Section X, the use of filtration is documented not only within the steel industry, but also within the cold rolling subdivision. With the exception of carbon adsorption, the other treatment components are also well demonstrated at cold rolling operations. As discussed in Section X, carbon adsorption has been successfully applied to the treatment of wastewaters containing similar organic contamination as cold rolling wastes. The technologies are reliable, demonstrated methods of treatment and thus are appropriate for incorporation in NSPS.

Flow Rates

Since recirculation systems should be incorporated at all new cold rolling operations regardless of the product type or mill configuration, the flow rate for NSPS is based upon the best demonstrated flow rates for recirculation mills. The best demonstrated recirculation mills attain flows of 10 gal/ton of steel rolled. Twenty-three cold rolling mills producing all types of products have demonstrated the ability to achieve this level. Therefore, NSPS has been developed using 10 gal/ton as the model flow.

Selection of an NSPS Alternative

The Agency selected NSPS Alternative No. 1 as the NSPS model treatment system upon which the proposed NSPS standards are based. This treatment system includes well demonstrated technologies and provides for removal of the solids, oils, organics, and metals found in cold rolling wastewaters. As with BAT (Section X), the Agency is proposing NSPS standards for four organic pollutants. The standards for these pollutants can be met by installing carbon adsorption systems. However, they can also be achieved by using oil solutions that do not contain these, or other toxic organic pollutants.

TABLE XII-1

NSPS EFFLUENT LIMITATION GUIDELINES
COLD ROLLING

	NSPS Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)									
	TSS	O & G	1,1,1-Trichloroethane (011)	2-Nitrophenol (057)	Anthracene (078)	Tetrachloroethylene (085)	Chromium (119)	Lead (122)	Zinc (128)	pH Units
NSPS Alternative 1										
Ave.	0.00063	-	-	-	-	-	0.0000042	0.0000083	0.000010	6-9
Max.	0.0013	0.00042	-	-	-	-	0.0000083	0.000017	0.000021	
NSPS Alternative 2*										
Ave.	0.00063	-	0.0000042	0.0000010	0.00000042	0.0000021	0.0000042	0.0000083	0.000010	6-9
Max.	0.0013	0.00042	0.0000083	0.0000021	0.00000083	0.0000042	0.0000083	0.000017	0.000021	

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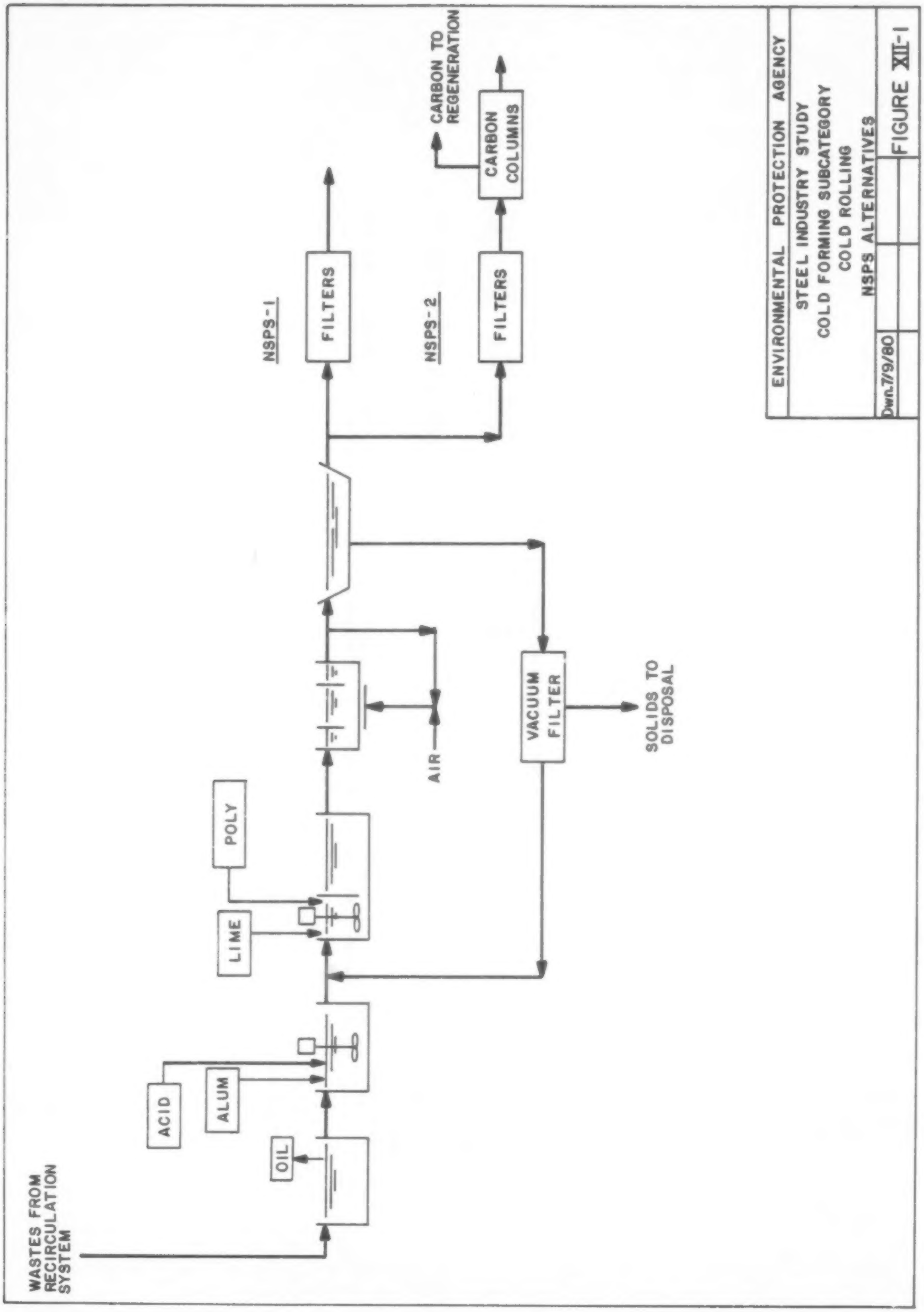
* Limitations for Alternative No. 2 selected for NSPS.



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
NSPS ALTERNATIVES

FIGURE XII-1

COLD FORMING SUBCATEGORY

COLD ROLLING

SECTION XIII

PRETREATMENT STANDARDS FOR THE DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section discusses the alternative control and treatment systems available for the cold rolling operations that discharge wastewaters to publicly owned treatment works (POTWs). The Agency has given separate consideration to the pretreatment of cold rolling wastewaters from new sources (PSNS) and from existing sources (PSES). The main factors considered in the development of pretreatment systems were the need to insure that the cold rolling wastewaters are treated sufficiently to avoid overloading the POTW treatment system and to insure that pollutants are not introduced into POTWs that will interfere with, pass through, or are otherwise incompatible with POTW operations. The general pretreatment and categorical standards applying to cold rolling operations are discussed below.

General Pretreatment Standards

For detailed information on Pretreatment Standards refer to 43 FR 27736-27773, "General Pretreatment Regulations for Existing and New Sources of Pollution," (June 26, 1978). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards and POTW pretreatment programs.

In establishing pretreatment standards for cold rolling operations, the Agency gave primary consideration to the objectives and requirements of the General Pretreatment Regulations. In addition, the Agency considered additional factors which are specifically applicable to cold rolling operations which are discussed below.

The General Pretreatment Regulations set forth general discharge prohibitions that apply to all nondomestic users of a POTW to prevent pass-through of pollutants, interference with the operation of a POTW, and municipal sludge contamination. The regulations also establish administrative mechanisms to ensure application and enforcement of prohibited discharge limits and categorical pretreatment standards. In addition, the Regulations contain provisions relating directly to the determination of and reporting on pretreatment standards.

Although wastewaters from many cold rolling operations are discharged to POTWs, POTWs are usually not designed to treat the toxic pollutants such as 1,1,1-trichloroethane, nitrophenol, anthracene, tetrachloroethylene, chromium, lead, and zinc which are present in cold rolling wastewaters. Instead, POTWs are designed to treat biochemical oxygen demand (BOD), suspended solids (TSS), fecal coliform bacteria, and pH. Whatever removal obtained by POTWs for toxic pollutants is incidental to the POTWs main function of treating conventional pollutants. POTWs have historically accepted extremely large amounts of many pollutants well above their capacity to treat them adequately. As the issue of municipal sludge use has become more important, pretreatment standards must address toxic pollutant removal, rather than transfer of these pollutants to POTWs where many pollutants concentrate in the sludges.

Due to the presence of many toxic pollutants in wastewaters from cold rolling operations, extensive pretreatment must be provided to ensure that these pollutants do not interfere with, pass through, or are otherwise incompatible with POTW operations or cause harm to the treatment plant. Additionally, oil and grease must be controlled by pretreatment standards to adequately control emulsified oils that may be present in cold rolling wastewaters. The Agency is not proposing pretreatment standards for suspended solids because this pollutant, in the amounts present in cold rolling wastewaters, is compatible with POTW operations and can be effectively treated at POTWs.

Identification of Pretreatment

New Sources (PSNS)

Pretreatment standards for new sources will be the same as New Source Performance Standards for direct dischargers (Section XII), with the exception that there are no PSNS standards proposed for two conventional pollutants, total suspended solids and pH. These two pollutants are effectively controlled in POTW systems.

Existing Sources (PSES)

The Agency considered two PSES alternative treatment systems. The first alternative includes the BPT and BAT-1 treatment system components. This system reduces solids, emulsified and floating oils, and the toxic metal pollutants that may be present in the wastewater. PSES Alternative No. 2 includes all the components of Alternative No. 1, plus a carbon adsorption system. This alternative removes essentially all toxic pollutants which could adversely affect the operation of the POTW, pass through the POTW and also reduces the possibility of contamination of the sludges in the POTW system.

Rationale for the Selection of Pretreatment Technologies

The intent of pretreatment is to provide sufficient treatment of the toxic pollutants or any conventional pollutants that could upset, pass through, or otherwise interfere with the operation of the POTW. Both of the alternative treatment systems achieve significant reductions of those pollutants (toxic metals and organics, emulsified oils) which could be detrimental to the operations of the POTW system.

As discussed in Volume I, metals present in industrial discharges may pass through a POTW system without being treated to any great extent. Since domestic wastes do not typically contain objectionable concentrations or quantities of toxic metals, POTW systems are not usually designed for removal of the metals. The toxic metal pollutants which do not pass through a POTW are concentrated in the POTW sludges. Generally, land application is the most advantageous, and least expensive method of the POTW sludge disposal as the sludge can be used to replace soil nutrients. However, excessive amounts of toxic metals in the sludges would inhibit plant growth thus rendering the sludge unfit for use as a soil nutrient supplement.

The organics in the wastes can also be detrimental to POTW operation in excessive levels, thus control measures for toxic organics have been included in the pretreatment alternatives. Reference is made to Volume I for additional information regarding the fate of those specific toxic organic pollutants found in cold rolling wastewaters in POTWs.

Treatment Scheme

The two pretreatment alternatives considered are identical to the NSPS alternatives discussed in Section XII. Refer to Section XII for justification of the equipment suggested.

Flow Rates

The flow rate used to develop the preatreatment standards for new sources (PSNS) is identical to the model flow for NSPS - 10 gal/ton. See Section XII for the rationale for the selection of this model flow.

The flow rates used in the PSES alternatives are equal to the model BAT flow rates. Based upon widespread demonstration, the Agency believes this is an achievable model flow for existing sources.

Selection of PSNS and PSES

The Agency relied upon the same rationale used in Sections X and XII to select appropriate treatment systems and effluent standards as pretreatment standards. Based upon the considerations presented in those sections, the Agency selected Alternative No.1 as the PSNS and PSES model treatment systems upon which the proposed pretreatment standards are based.

The proposed PSNS standards for cold rolling operations are presented in Table XIII-1. The proposed PSES standards are presented in Table XIII-2. No effluent standards are proposed for suspended solids and pH as these conventional pollutants receive sufficient treatment in POTWs. Because the oils present will most likely be of the emulsified type, standards for oil are proposed since these oils contain the toxic organic pollutants and since POTW systems are not equipped to treat high levels of emulsified oils. These oils tend to interfere with the biological treatment process by affecting oxygen transfer, coating the biological floc, and hindering floc settling.

TABLE XIII-1

PSNS EFFLUENT LIMITATION GUIDELINES
COLD ROLLING

	PSNS Effluent Limitations in kg/kkg (lbs/1000 lbs)[1]								
	O & G	1,1,1-Tri-chloroethane (011)	2-Nitrophenol (057)	Anthracene (078)	Tetrachloro-ethylene (085)	Chromium (119)	Lead (122)	Zinc (128)	pH Units
PSNS Alternative 1									
Ave.	-	-	-	-	-	0.0000042	0.0000083	0.000010	6-9
Max.	0.00042	-	-	-	-	0.0000083	0.000017	0.000021	
PSNS Alternative 2*									
Ave.	-	0.0000042	0.0000010	0.00000042	0.0000021	0.0000042	0.0000083	0.000010	6-9
Max.	0.00042	0.0000083	0.0000021	0.00000083	0.0000042	0.0000083	0.000017	0.000021	

---

* Limitations for Alternative No. 2 selected for PSNS.

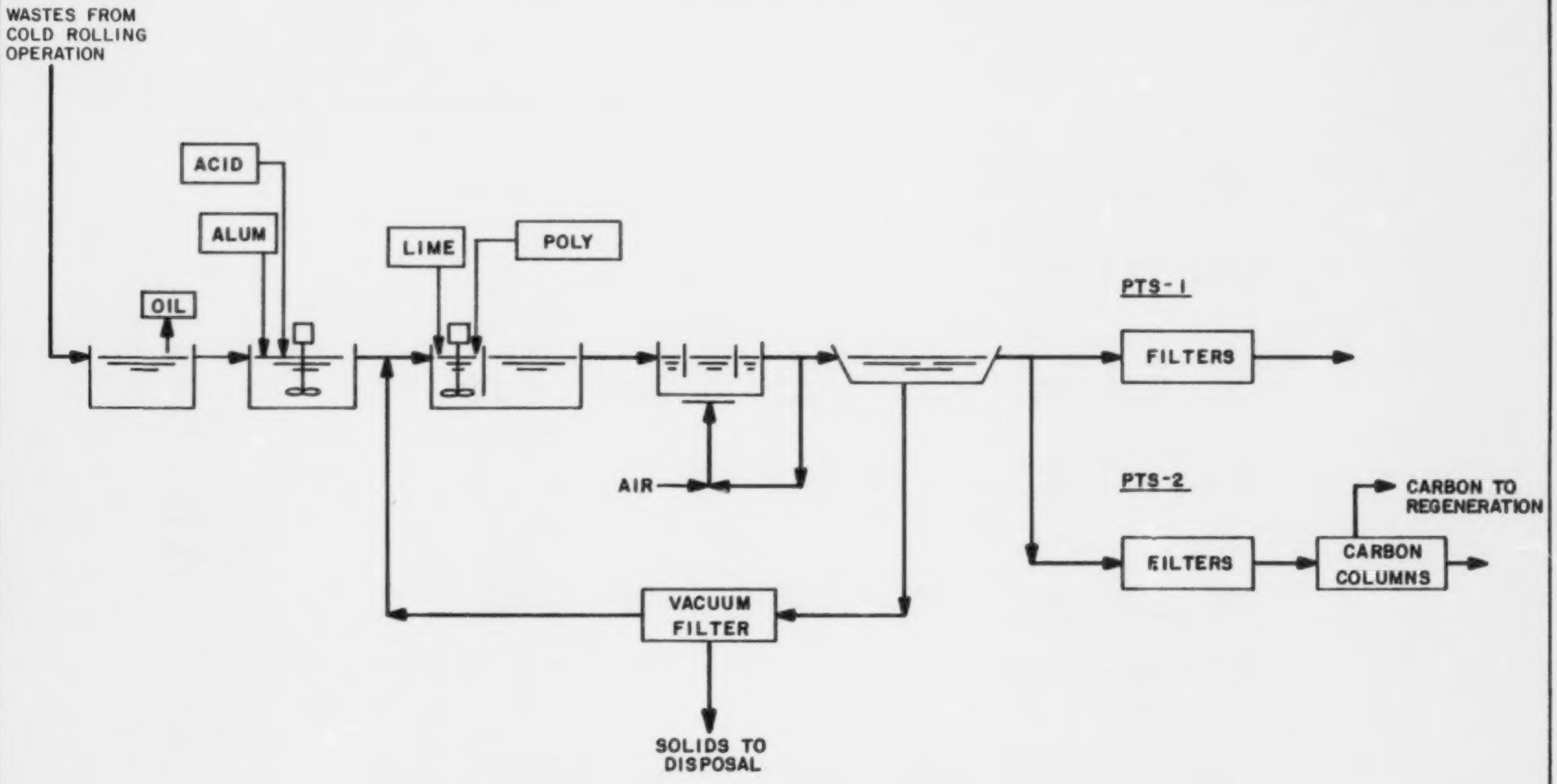
TABLE XIII-2

PSES EFFLUENT LIMITATION GUIDELINES
COLD ROLLING

	PSES Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)							
	O & G	1,1,1-Tri-chloroethane (011)	2-Nitrophenol (057)	Anthracene (078)	Tetrachloro-ethylene (085)	Chromium (119)	Lead (122)	Zinc (128)
Recirculation								
PSES								
Alternative 1								
Ave.	-	-	-	-	-	0.000010	0.000021	0.000026
Max.	0.0010	-	-	-	-	0.000021	0.000042	0.000052
PSES								
Alternative 2*								
Ave.	-	0.000010	0.0000026	0.0000010	0.0000052	0.000010	0.000021	0.000026
Max.	0.0010	0.000020	0.0000052	0.0000021	0.000010	0.000021	0.000042	0.000052
Combination								
PSES								
Alternative 1								
Ave.	-	-	-	-	-	0.00010	0.00021	0.00026
Max.	0.010	-	-	-	-	0.00021	0.00042	0.00052
PSES								
Alternative 2*								
Ave.	-	0.00010	0.000026	0.000010	0.000052	0.00010	0.00021	0.00026
Max.	0.010	0.00020	0.000052	0.00021	0.00010	0.00021	0.00042	0.00052
Direct Application								
PSES								
Alternative 1*								
Ave.	-	-	-	-	-	0.00017	0.00033	0.00042
Max.	0.017	-	-	-	-	0.00034	0.00066	0.00084
PSES								
Alternative 2								
Ave.	-	-	-	-	-	0.00017	0.00033	0.00042
Max.	0.017	-	-	-	-	0.00034	0.00066	0.00084

---

* Limitations for this alternative selected for PSES.



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STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD ROLLING
PRETREATMENT ALTERNATES

Dwn. 7/9/80

FIGURE XIII-1

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION I

PREFACE

The USEPA is proposing effluent limitations guidelines and standards for the iron and steel industry. The proposed regulation will contain effluent limitations guidelines for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS), under Section 301, 304, 306, 307 and 501 of the Clean Water Act.

This part of the Development Document highlights the technical aspects of EPA's study of the Cold Worked Pipe and Tube Subdivision of the Cold Forming Subcategory of the Iron and Steel Industry. Volume I of the Development Document discusses issues pertaining to the industry in general, while other volumes relate to the remaining subcategories of the industry.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION II

CONCLUSIONS

This report highlights the technical aspects of EPA's study of the cold worked pipe and tube subdivision of the cold forming subcategory of the Iron and Steel Manufacturing Category.

Based on this current study and a review of previous studies, the Agency has reached the following conclusions:

1. In the previous study,[1] cold worked pipe and tube operations were part of the pipe and tube subcategory. However, additional data obtained since that time indicate that the limitations promulgated in 1976 for all pipe and tube operations are not appropriate for cold worked pipe and tube operations.

2. The cold worked pipe and tube subdivision is further segmented into those operations using water and those using soluble oil solutions. Differences in wastewater characteristics, wastewater treatability, and process water usage are the basis for this division.

3. As the Agency has determined that the BPT limitations originally promulgated for pipe and tube operations are not representative of cold worked pipe and tube operations, new BPT limitations are being proposed. For those operations using water, the Agency proposes a zero discharge limitation. EPA proposes that those plants using soluble oil solutions recycle most of the solutions with a small amount, 0.5 gal/ton, disposed of by a contract hauler. There is no discharge to navigable waters. Incineration is an alternate method of disposal.

4. EPA estimates that industry will incur the following costs in complying with the proposed cold worked pipe and tube limitations.

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[1] EPA-440/I-76/084-b, Development Document for Interim Final Effluent Limitation Guidelines and Proposed New Source Performance Standards for the Forming, Finishing and Speciality Steel Segment of the Iron and Steel Manufacturing Point Source Category.

	Costs (Millions of July 1, 1978 Dollars)			
	Investment			Total
	Total	In-place	Required	Annual
Using Water				
BPT	7.1	3.9	3.2	1.8
Using Soluble Oil Solutions				
BPT	1.1	1.1	0	1.1
TOTAL	8.2	5.0	3.2	2.9

5. EPA estimates that compliance with the proposed BPT limitations in the cold forming-cold worked pipe and tube subdivision will result in significant removals of conventional and toxic pollutants. A summary of the removals occurring as a result of the proposed BPT limitations follows:

	Process Flow (MGD)	Effluent Loadings (Tons/Year)	
		Toxic Organics	Conventional Pollutants
Using Water			
Raw Waste	29.6	0	2,888
Proposed BPT	0	0	0
Using Soluble Oil Solutions			
Raw Waste	18.0	541.5	1,974,000
Proposed BPT	0	0	0

6. Based upon the data available, the Agency has been unable to determine whether or not toxic pollutants are present in wastewaters from cold worked pipe and tube operations using water. The Agency is continuing its investigation of these wastewaters. If toxic pollutants are found, the Agency will promulgate a BAT limitation of zero discharge for cold worked pipe and tube operations using water.

7. The Agency determined that the proposed BPT limitations for cold worked pipe and tube operations using soluble oil solutions provide sufficient pollution control. Therefore, the proposed BAT limitations are identical to the proposed BPT limitations for these operations. Additional investment or energy expenditures are not required at BAT.

8. The BCT model treatment systems are identical to the corresponding BPT model treatment systems for all cold worked pipe and tube operations. Therefore, the proposed BCT limitations are identical to the corresponding BPT limitations.

9. The proposed NSPS for pipe and tube plants using water is identical to the corresponding proposed BPT limitation.

10. Two NSPS alternative treatment systems were considered for plants using soluble oil solutions. The selected alternative is identical to the corresponding BPT model treatment system. The other alternative, which includes a treatment system prior to discharge to navigable waters, is not recommended because it is impractical and very costly.

11. At this time, EPA is not proposing specific PSES or PSNS for pipe and tube operations using water. Instead, General Pretreatment Regulations (43 FR 27736-27773, "General Pretreatment Regulations for Existing and New Sources of Pollution," (Monday, June 26, 1978)) only apply for these operations. However, should toxic pollutants be found as a result of the Agency's continuing investigation, the Agency will promulgate PSES and PSNS based upon zero discharge for cold worked pipe and tube operations using water.

12. The Agency is proposing zero discharge at PSES and PSNS for those cold worked pipe and tube operations using soluble oil solutions.

13. With regard to the "remand issues," the Agency has concluded that:

    a. It need not provide a special retrofit cost allowance for older cold worked pipe and tube plants. Analysis indicates that the age of a plant has no effect upon the ease or cost of retrofitting pollution control equipment.

    b. No significant water consumption is expected to occur in cold worked pipe and tube operations as a result of compliance with the proposed limitations and standards.

14. Table II-1 presents the proposed limitations and standards corresponding to the BPT, BAT, BCT, NSPS, PSES, and PSNS treatment levels for cold worked pipe and tube operations using water and soluble oil solutions.

15. The Agency has only limited data available for cold worked pipe and tube operations. In order to better identify and characterize the quality of wastewaters from these operations, the Agency is continuing its investigation. The Agency solicits comments and any available data or information which may be helpful in this regard.

TABLE II-1

PROPOSED EFFLUENT LIMITATIONS AND STANDARDS
COLD FORMING SUBCATEGORY
COLD WORKED PIPE AND TUBE

Treatment Level	Effluent Limitations and Standards
Operations Using Water	
BPT	No discharge of process wastewater pollutants to navigable waters.
BAT	No limitations presently proposed.
BCT	No discharge of process wastewater pollutants to navigable waters.
NSPS	No discharge of process wastewater pollutants to navigable waters.
PSES	"General Pretreatment Regulations" are referenced.
PSNS	"General Pretreatment Regulations" are referenced.
Operations Using Soluble Oil Solutions	
BPT	No discharge of process wastewater pollutants to navigable waters.
BAT	No discharge of process wastewater pollutants to navigable waters.
BCT	No discharge of process wastewater pollutants to navigable waters.
NSPS	No discharge of process wastewater pollutants to navigable waters.
PSES	No discharge of process wastewater pollutants to navigable waters.
PSNS	No discharge of process wastewater pollutants to navigable waters.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION III

INTRODUCTION

General Discussion

In cold worked pipe and tube operations, cold flat steel strip (skelp) is formed into hollow cylindrical products followed by electrical resistance welding of the seam. During this operation, wastewaters are generated because contact cooling water or soluble oil solutions are continuously flushed over the cold pipe and tube products for cooling and lubrication purposes. Those wastewaters require treatment prior to discharge to a receiving stream.

In 1976, the Agency sent basic questionnaires (DCPs) to approximately 85% of the cold worked pipe and tube mills in the United States. The responses to the DCPs for one hundered twenty-six cold worked pipe and tube mills provided information regarding applied and discharge flow rates, wastewater treatment systems installed, mill capacities, and modes of operation. The data contained in the DCPs have been tabulated and summarized in Tables III-1 and III-2.

Detailed data collection portfolios (D-DCPs) were sent to selected pipe and tube mills to gather information on treatment costs, and on the pipe and tube mill process. Responses were received for two water and three oil pipe and tube mills. Tables III-3 and III-4 summarize the data base for this report as derived from the above mentioned sources of information.

Pipe and tube operations are no longer treated as a separate subcategory. Hot worked pipe and tube plants are incorporated in the hot forming subcategory, while cold worked pipe and tube plants are included in the cold forming subcategory. Cold worked pipe and tube operations are further segmented based upon the lubricant used: water or oil.

Description of Pipe and Tube Mills

Cold Expanded Pipe

The properties of hot rolled seamless pipe can be improved by cold working the product. Cold working the pipe increases its yield strength and generally improves the product. One method of cold working is the seamless pipe method, in which the hot rolled pipe (after cooling) is conveyed to a cold expander mill. The hot rolled pipe is dropped into an expander trough and clamped with one end held firmly against a backstop. A long ram is positioned at the opposite end of the pipe, and an expander plug is forced through the pipe by extreme pressure. The plug is lubricated through the ram head with a water soluble oil. After cold expansion, the seamless pipe enters a rotary straightener and then is hydrostatically tested.

Cold Drawn Tube

While most quality requirements for seamless pipe and tubing products can be met by the hot rolling processes, some pipe and tube specifications require closer tolerance, enhanced physical and surface properties, thinner walls, and smaller diameters than can be produced by hot worked methods. These specifications can be met by cold drawing the hot rolled tubes in a finishing operation.

The process consists of pulling a cold tube through a die, the hole of which is smaller than the outside diameter of the tube being drawn. At the same time, the inside surface of the tube is supported by a mandrel anchored on the end of a rod, so that the mandrel remains in the plane of the die during the drawing operation. Another method involves using an internal bar rather than a stationary mandrel. This bar travels along with the tube, as it is drawn through the die. The hot rolled tubes are crimped and pointed on one end, so that the pipe section can pass through the die and permit the jaws of the puller mechanism to grip the end of the tube. Some tubes of certain steel grades are annealed prior to the cold drawing operation. All tubes are pickled to remove scale and oxides, rinsed, and then dipped into a lubricant tub (flour, tallow and water, or a special oil emulsion for a bright finish) prior to the cold drawing operation.

Other cold tube reducing methods, such as the "Rockrite" process, are also used for cold drawing. The "Rockrite" process accomplishes simultaneous reduction of tube diameter and wall thickness by a cold swaging action, which uses compressive forces rather than tensile forces, as used in conventional cold drawing. In the "Rockrite" process, two semi-circular dies have matched, tapered, semi-circular grooves machined into their curved faces. In operation, one die is placed on top of the other, so that the matched semi-circular grooves make a circular pass. The dies are geared to each other in such a manner that they rotate in opposite directions when they are moved laterally, and a converging circular pass is traced by the die grooves. When a tube is held stationary on the centerline of this pass, the converging path of the die grooves reduces its diameter. If a stationary mandrel of the proper taper is also positioned in the center line of the pass, the inside of the tube is supported between the die and mandrel. When in operation, the dies are in constant lateral and rotary reciprocal motion. Coolant solutions are constantly poured onto the dies.

Electric Resistance Welded Tubing

Electric resistance welded tubing is referred to as ERW tubing. Strip, sheet, or plate in coil form is used as a starting material for the ERW process. The steps used in the manufacture of ERW tubing are: forming, welding, sizing, cutting, and finishing.

The width of the tubing produced from strip equals the circumference of the tubing to be welded. If extra wide strip is used, it is passed through a slitting-line for cutting to proper width and then recoiled. The proper width strip is fed into forming rolls. The forming rolls consist of an edge trimmer (to smooth and clean the edge of the strip for welding and forming), closing, and fin pass rolls. After the fin rolls, the strip enters the welding section where the tube is held in pressurized squeeze rolls, as the edges are heated to welding temperature. The heat for welding is provided by low-frequency power through electrode wheels, by radio-frequency power through sliding contacts, or by coil induction. Typical power for welding is supplied at 450,000 cycles per second. The welded tube then passes under a cutting tool, which removes the flash resulting from the pressure during welding. The welded seam or entire tube is then annealed or normalized, depending on the required metallurgy. After cooling, the tube is sized on horizontal and vertical sizing rolls, to obtain a round finished product of the desired diameter. After sizing, the tube is cut to length and straightened, and end-finished if required. The tubes are then inspected and packed for shipment.

Electric Welded Pipe

The electric weld process or fusion weld is used to produce pipe in unlimited diameters. If the desired pipe circumference exceeds the plate width, two or more plates may be welded together to provide the necessary width. The steps required to make plates into pipe by the electric weld process are shearing, planing, crimping, bending, welding, expanding, and finishing.

Plate is transferred to the edge-planing machine, where it is aligned so that the two edges will be parallel and square with the ends after planing. Forming plate into circular pipe is usually performed in three operations called crimping, "U"-ing, and "O"-ing. The first operation, crimping, consists of bending the edges in a press, so as to avoid a flat surface near the longitudinal seam of the pipe. The crimped plate is then conveyed to a "U"-ing machine. In this operation, the plate is centered over a series of parallel rocker-type dies, which lie along the axis of the plate. A large "U"-shaped die operated by a press, as long as the longest length of plate, is moved down on the plate, forcing it between the dies which automatically conform themselves to the operations and assist in forming the plate into the "U"-shape. The plate is then transferred to what is called the "O"-ing machine. The machine consists of two semi-circular dies, which are as long as the plate. Rollers mounted on vertical spindles prevent the plate from falling and keep it in correct alignment as it enters the "O"-ing machine. The "U"-shaped plate rests in the bottom die, and the top die is forced down by a press, deforming the plate until it is the shape of an almost closed circle, which is then ready for welding. The pipe is held in position for welding by a longitudinal rod, which maintains the proper gap for welding. A specially designed welding head deposits flux along the joint, feeds the metal electrode, and transmits welding current to the joint and electrode. Molten filler metal is deposited from the metal electrode to the work and replaces the fluid flux and forms the weld. After the pipe is welded on the outside, it is then welded on the inside by an automatic welding machine mounted on the end of a long cantilever arm. The pipe is drawn over this arm by a carriage. After welding, the scaly deposit left from the flux is removed by a cantilevered tube device.

The final pipe diameter is obtained by either hydraulically expanding the shell against a retaining jacket or mechanically expanding it over an inside mandrel. In hydraulic expansion, the ends are expanded to the proper diameter by mandrels. Retainer rings encircle the body of the pipe, which is filled with water and hydraulically expanded to the limits of the bands. This also serves as a hydraulic test. The expansion, by either method, sizes, rounds, and straightens the pipe and provides a good test of the weld. Attention is given to nondestructive inspection of the weld by X-ray examination. The pipe is then placed in special machines which face the ends, to ensure that they are smooth and at right angles. If the joints are to be welded,the ends are beveled in this operation prior to shipment.

More specific details of a typical ERW operation are presented in Figure III-1.

TABLE III-1

GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied Flow	Discharge Flow	Process Treatment	Central Treatment		
0060	Welded Tube (01-08 mills)	CS 100	01-07 1963 08 - 1974	196 Total for 8 Mills	3673	0	None	CNT1 100 PSP, SSP, FFOP	RTP 100	Zero Discharge
0060H	Welded Tube	SS 98 HSLA 2	1970	9.6	Dry Operation					
0060P 01	Welded Pipe	SS 100	1968	0.3	1920	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 02	Welded Tube and Pipe	SS 100	1968	0.6	960	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 03	Welded Tube and Pipe	SS 100	1968	0.9	640	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 04	Welded Pipe	SS 100	1968	0.3	1920	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 05	Welded Tube	SS 100	1968	1.8	320	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 06	Welded Tube and Pipe	SS 100	1968	0.6	960	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 07	Welded Tube	SS 100	1969	0.9	640	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0060P 08	Welded Tube	SS 100	1976	1.5	384	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 2

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied Flow	Flows (gallons/ton) Discharge Flow	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0060P 09	Welded Pipe	SS 100	1976	0.3	1920	Unk	None	CNT2(Unk), SL(Unk)	OT	Evaporation and Percolation Pond
0112A 03	Welded Pipe	CS 100	1957	858	Unk	Unk	None	CNT2(Unk), SS, Scr, NL, AE, FLA, FLP, SL(Unk), CY, T	OT	Direct
0112E	Welded Pipe	CS 45 HSLA 55	1962	1134	Unk	Unk	PSP	None	RET 100	Indirect
0176C	Welded Tube (01-19 mills)	SS 100	1947	22.8 Total for 19 mills	1990	Unk	-	CNT1(Unk), CT	RTP(Unk) RET(Unk) BD(Unk)	POTW
0176D	Welded Tube (01-04 mills)	SS 100	1972	9 Total for 4 mills	2880	Unk	-	CNT1(Unk), CT	RTP(Unk) RET(Unk) BD(Unk)	POTW
0256F	Welded Tube (04-06 mills)	SS 100	1968	4.5 Total for 3 mills	Unk	0	None	-	RUP 100	Zero Discharge
0432A 05	Welded Tube	CS 80 HSLA 20	1957	444	Unk	0	-	None	R(Unk)P 100	Zero Discharge
0492A 01	Welded Tube	CS 100	1953	1011.4	22,211	17,731	PSP, SS	CNT2 20.2, SL(Unk)	RTP 20.2 RET 79.8	Recirc. Reservoir
0492A 02	Welded Tube	CS 100	1953	669.2	33,784	26,926	PSP, SS	CNT2 20.3, SL(Unk)	RTP 20.3 RET 79.7	Recirc. Reservoir
0492A 03	Welded Pipe	CS 100	1962	246	2049	2039	None	CNT2 0.5, SL(Unk)	RTP 0.5 RET 99.5	Recirc. Reservoir

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 3

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied Flow	Flows (gallons/ton) Discharge Flow	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0492A 04	Cold Drawn Tube	CS 100	1970	339	1920	1910	None	CNT2 0.5, SL(Unk)	RTP 0.5 RET 99.5	Recirc. Reservoir
0548C 01	Welded Tube	CS 100	1966	Unk	Unk	Unk	None	None	OT	Direct
0548C 02	Welded Tube	CS 50 SS 50	1966	Unk	Unk	Unk	None	None	OT	Direct
0548C 03	Welded Tube	CS 50 SS 50	1975	Unk	Unk	Unk	None	None	OT	Direct
0584H	Welded Tube and Pipe	CS 100	1976	246	51,483	3512	-	CNT2 92.3 PSP, SS, SSP, CT, NW	Losses 1.2 BD 6.4 RTP 92.4	POTW - 0.1 Direct-6.4
0684A 01	Welded Tube	CS 80 HSLA 20	1963	1050	1824	453	-	-	RUP 75.2 BD 24.8	Direct
0684K 01	Welded Tube	*	1957	*	*	0	-	CNT1(Unk), PSP, SS	RTP 100	Zero Discharge
0684K 03	Welded Tube	*	1961	*	*	0	-	CNT1(Unk), PSP, SS	RTP 100	Zero Discharge
0684K 05	Welded Tube	*	1930	*	*	0	-	CNT1(Unk), PSP, SS	RTP 100	Zero Discharge
0684K 06	Welded Tube	*	1938	*	*	0	-	CNT1(Unk), PSP, SS	RTP 100	Zero Discharge
0684K 07	Welded Tube	*	1938	*	*	0	-	CNT1(Unk) PSP, SS	RTP 100	Zero Discharge
0684K 04	Welded Tube	*	1937	*	*	0	PSP, SS	None	RTP 100	Zero Discharge

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 4

Plant Code	Product	Type of Steel	Mill Age	Mill size (Tons/Day)	Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied Flow	Discharge Flow	Process Treatment	Central Treatment		
0856N 05	Welded Pipe	CS 100	1965	435	2979	2979	PSP	CNT2 2.5, SL(Unk), SS	OT	Direct
0856Q 03	Welded Tube	CS 70 HSLA 30	1950	1155	Unk	Unk	PSP	CNT2(Unk), SL(Unk), SS	OT	Direct
0864A	Welded Tube, Submerged Arc Welded Pipe, Elec. Resistance Welded Pipe	CS 68 HSLA 32	1955	489	589	589	PSP	CNT2 1.2, SL(Unk), SS	OT	Direct
0868B	Double Submerged Arc - Welded Pipe	CS 25 HSLA 75	1978	Not Yet In Operation		-	-	CNT2 0.7, F(Unk) (Unk)P, SS, SL(Unk)	OT	Direct
0884C	Seamless Pipe and Tube Cold Drawn and Welded Tube	CS 90 HSLA 10	1961	21	720	720	-	None	OT	Direct
0884E	Cold Drawn and Welded Tube	SS 100	1968	13.5	Unk	Unk	None	CNT2 (Unk), NL	OT	POTW
0884H	Cold Drawn Tube	SS 100	1976	4.5		Dry Operation				
0908	Welded Tube	CS 100	1976	156	Unk	0	CT	None	RTP 100	Zero Discharge
0908A 01	Welded Tube	CS 100	1971	327	Unk	0	CT	None	RTP 100	Zero Discharge

TABLE III-1
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)
PAGE 5

					Flows (gallons/ton)		Treatment Components			
Plant Code	Product	Type of Steel	Mill Age	Mill size (Tons/Day)	Applied Flow	Discharge Flow	Process Treatment	Central Treatment	Operating Mode	Discharge Mode
0908A 02	Welded Tube	CS 100	1971	285	Unk	0	CT	None	RTP 100	Zero Discharge
0920D	Welded Tube	CS 100	1973	40.2	Dry Operation					
0948B	Welded Tube	CS 100	1930	Idle	NA	NA	PSP	None	-	-

-: There is insufficient data to determine if such systems exist.
*: Confidential information.

None: The available data imply that no such systems exist.
Unk : The magnitude of the stream was not calculable from the available data.
NA : Not applicable.

CS# : % Carbon Steel
HSLA#: % High Strength Low Alloy Steel
SS# : % Stainless Steel

NOTE: Refer to Table VII-1 for definitions of the abbreviations used in this table.

TABLE III-2

GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied Flow	Flows (gallons/ton) Discharge Flow	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0080A 01	Welded Tube	CS 100	1954	21.8	Unk	Unk	-	CNT1(Unk), CT	RUP(Unk)	Oil solutions are hauled
0080A 02	Welded Tube	CS 100	1954	21.8	Unk	Unk	-	CNT1(Unk), CT	RUP(Unk)	Oil solutions are hauled
0080A 03	Welded Tube	CS 100	1954	21.8	Unk	Unk	-	CNT1(Unk), CT	RUP(Unk)	Oil solutions are hauled
0240B 01	Welded Tube	CS 100	1937	20.7	3478	1.13	FFOP	-	RTP 99	Oil solutions are hauled
0240B 02	Welded Tube	CS 100	1946	12	6000	Unk	FFOP	-	RTP(Unk)	Oil solutions are hauled
0240B 03	Welded Tube	CS 100	1961	99	Unk	Unk	FFOP	-	RTP(Unk)	Oil solutions are hauled
0240B 04	Welded Tube	CS 100	1961	141	Unk	Unk	FFOP	-	RTP(Unk)	Oil solutions are hauled
0240C 01	Welded Tube	CS 100	1955	39.3	Unk	Unk	None	None	RUP(Unk)	Oil solutions are hauled
0240C 02	Welded Tube	CS 97 HSLA 3	1963	122.7	Unk	Unk	None	None	RUP(Unk)	Oil solutions are hauled
0240C 03	Welded Tube	CS 95 HSLA 5	1969	217.8	Unk	Unk	None	None	RUP(Unk)	Oil solutions are hauled
0240C 04	Cold Drawn Tube	CS 100	1974	102	Unk	Unk	None	None	RUP(Unk)	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 2

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied Flow	Flows (gallons/ton) Discharge Flow	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0256F	Welded Tube (01-03 mills)	CS 99.5 HSLA 0.5	1953	189 Total for 3 mills	1143	0	CT	-	RTP 100	Zero discharge
0548A 03	Welded Tube	CS 100	1970	*	*	*	*	*	*	*
0636 01	Welded Tube	CS 100	1963	Unk	Unk	Unk	-	-	RUP(Unk)	Oil solutions are hauled
0636 02	Welded Tube	CS 100	1963	Unk	Unk	Unk	-	-	RUP(Unk)	Oil solutions are hauled
0636 03	Welded Tube	SS 100	1960	Unk	Unk	Unk	-	-	RUP(Unk)	Oil solutions are hauled
0636 04	Welded Tube	SS 100	1975	Unk	Unk	Unk	-	-	RUP(Unk)	Oil solutions are hauled
0684K 02	Welded Tube	*	1960	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 08	Welded Tube	*	1968	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 09	Welded Tube	*	Unk	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 10	Welded Tube	*	1960	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 11	Welded Tube	*	1944	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 12	Welded Tube	*	1947	*	*	*	PSP	None	RTP *	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 3

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton)		Treatment Components		Operating Mode	Discharge Mode
					Applied Flow	Discharge Flow	Process Treatment	Central Treatment		
0684K 13	Welded Tube	*	1952	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 14	Welded Tube	*	1966	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 15	Welded Tube	*	1972	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684K 16	Welded Tube	No Information								
0684L 01	Welded Tube	*	1967	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684L 02	Welded Tube	*	1975	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684L 03	Welded Tube	*	1975	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684L 04	Welded Tube	*	1976	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684M 01	Welded Tube	*	1934	*	*	*	None	CNTl * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684M 02	Welded Tube	*	1929	*	*	*	None	CNTl * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684M 03	Welded Tube	*	1959	*	*	*	None	CNTl * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684M 04	Welded Tube	*	1959	*	*	*	None	CNTl * PSP, Cooler	RTP * RET *	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 4

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied Flow	Flows (gallons/ton) Discharge Flow	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684M 05	Welded Tube	*	1959	*	*	*	None	CNT1 * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684M 06	Welded Tube	*	1965	*	*	*	None	CNT1 * PSP, Cooler	RTP * RET *	Oil solutions are hauled
0684N 01	Welded Tube	*	1925	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 02	Welded Tube	*	1925	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 03	Welded Tube	*	1925	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 04	Welded Tube	*	1965	*	*	*	PSP	None	RTP *	Oil solutions are hauled
0684N 05	Welded Tube	*	1942	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 06	Welded Tube	*	1946	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 07	Welded Tube	*	1959	*	*	*	Cooler	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
0684N 08	Welded Tube	*	1943	*	*	*	None	CNT1 * PSP	RTP * RET *	Oil solutions are hauled
06840	Welded Pipe	*	1968	*	*	*	PSP, SS	None	RTP *	Direct (Ground Evaporation)
0684W 01	Welded Tube	*	1969	*	*	*	PSP,Cooler	None	RTP *	Oil solutions are hauled

TABLE III-2
GENERAL SUMMARY TABLE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)
PAGE 5

Plant Code	Product	Type of Steel	Mill Age	Mill Size (Tons/Day)	Flows (gallons/ton) Applied Flow	Flows (gallons/ton) Discharge Flow	Treatment Components Process Treatment	Treatment Components Central Treatment	Operating Mode	Discharge Mode
0684W 02	Welded Tube	*	1969		*	*	PSP,Cooler	None	RTP *	Oil solutions are hauled
0856Q 04	Welded Tube	CS 30 HSLA 70	1963	1.	Unk	Unk	PSP	None	OT	Oil solutions are hauled
0916A 02	Welded Tube	CS 100	1954	72	Unk	Unk	None	None	RUP Unk	Oil solutions are hauled

---

: Bracketed data was derived from D-DCP.
- : There is insufficient data to determine if such systems exist.
* : Confidential information.

CS# : % Carbon Steel
HSLA# : % High Strength Low Alloy Steel
SS# : % Stainless Steel

None: The available data imply that no such systems exist.
Unk : The magnitude of the stream was not calculable from the available data.

NOTE: Refer to Table VII-1 for definitions of the abbreviations used in this table.

TABLE III-3

DATA BASE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

	Number of Mills	Percent of Total Number of Mills	Daily Capacity of Mills (Tons)	Percent of Total Daily Capacity
Mills sampled for D/D 3/76	1	1.4	300	3.2
Mills sampled for this study	0	0	0	0
Mills which responded with D-DCP data	1	1.4	24.5	0.26
Mills sampled and/or surveyed via D-DCP	2	2.8	324.5	3.46
Mills responding to DCP	71(1)	85	9358.9	85

---

(1) This total includes three mills with unknown tonnages and two mills which are not operating.

TABLE III-4

DATA BASE
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

	Number of Mills	Percent of Total Number of Mills	Daily Capacity of Mills (Tons)	Percent of Total Daily Capacity
Mills sampled for D/D 3/76	0	0	0	0
Mills sampled for this study	0	0	0	0
Mills which responded with D-DCP data	3	5.9	110.7	3.2
Mills sampled and/or surveyed via D-DCP	3	5.9	110.7	3.2
Mills responding to DCP	51 (1)	85	3507.75	85

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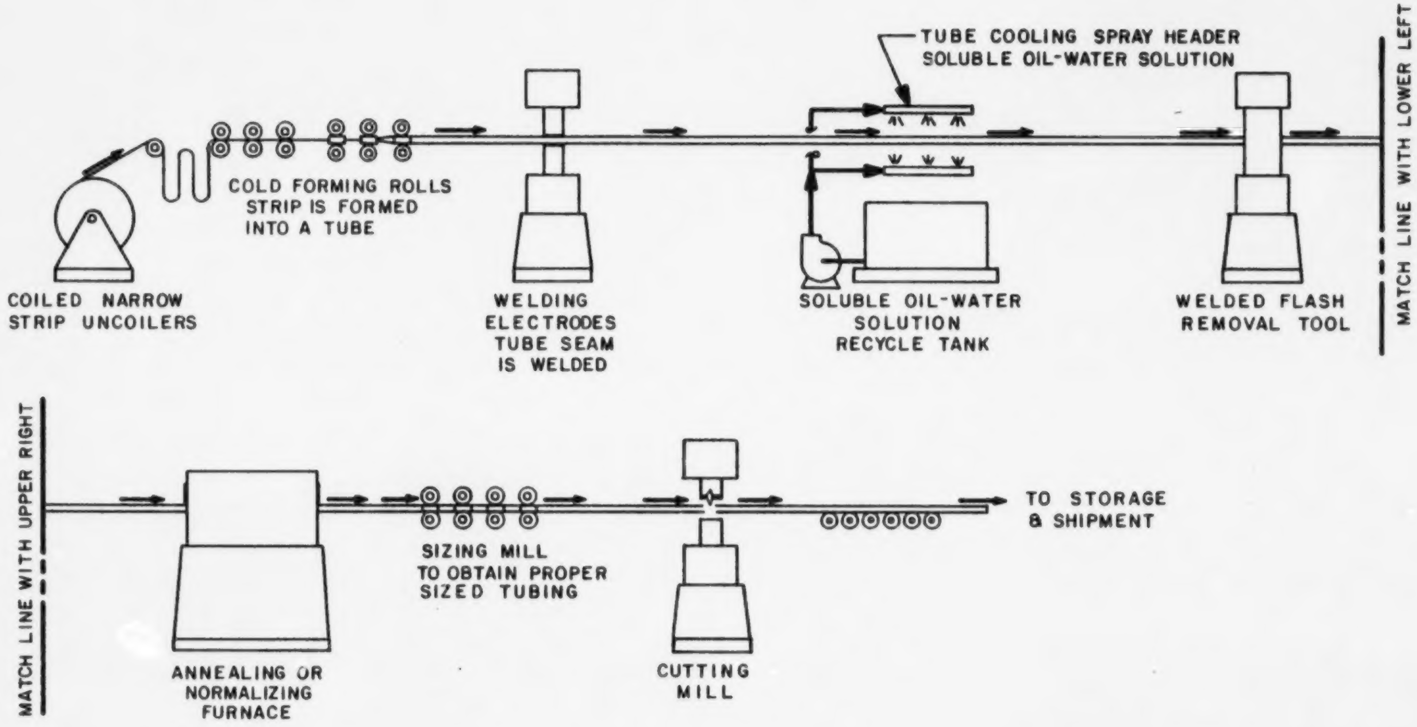
(1) This total includes five mills which did not provide production data.



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD WORKING TUBING MILL
ELECTRIC RESISTANCE WELDED
PROCESS FLOW DIAGRAM
Dwn. 3/14/79
FIGURE III-1

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION IV

SUBCATEGORIZATION

Introduction

Originally, cold worked pipe and tube operations were included in the pipe and tube subcategory. Based upon data obtained since the promulgation of the previous regulation, the Agency has found significant differences between the hot worked and cold worked pipe and tube subdivisions. Accordingly, cold worked pipe and tube operations now constitute a subdivision of the cold forming subcategory. The cold forming subcategory also includes cold rolling operations. As the Agency found variations in the final products and manufacturing processes between these two types of cold forming operations, it subdivided the subcategory into the cold rolling and cold worked pipe and tube subdivisions.

The Agency also believes that within the cold worked pipe and tube subdivision, further segmentation is appropriate based upon the type of process solution used (see discussion below). The Agency examined other factors, including raw materials, size and age, and geographic location, but found that they have no significant effect on further segmentation. Each of these factors is discussed in greater detail below.

Factors Considered in Subdivision

Manufacturing Process and Equipment

The cold working processes manufacture cold drawn or welded pipe and tube from cold semi-finished products, strip, or skelp. Several processes are employed to manufacture these products. Electric resistance welding, fusion welding, and cold drawing are all cold working operations which encompass similar equipment and processes. Therefore, the Agency believes that no further division or segmentation is necessary on this basis.

Final Products

Products of various dimensions can be manufactured in cold working pipe and tube mills. Different types of equipment are employed in the manufacture of these products. While some processes use water solutions for lubrication and cooling purposes, others use soluble oil solutions. Although the quality and quantity of waste solutions may vary, the Agency did not find any correlation between the products manufactured and the waste solutions generated.

Raw Materials

The raw materials used in cold worked pipe and tube operations include steels of various material specifications. For purposes of this discussion, any mill producing less than 50% of its output as carbon steel is termed a "specialty mill." The raw materials used in the manufacture of a finished product have little bearing upon the subdivision or segmentation of cold worked pipe and tube operations.

Wastewater Characteristics

A review of the DCP data indicates the need for further segmentation based upon the process wastewaters generated in the cold worked subdivision. The plant survey data indicates that soluble oil solutions are used in some cold working mills for process requirements, while only water is used at the remaining cold working mills. On this basis, the segmentation of the cold working process was made.

Wastewater Treatability

As indicated above, the treatability of cold worked pipe and tube wastewaters differs between mills using water and mills using soluble oil solutions. The various model treatment systems recognize this difference and provide separate treatment for the two types of waste solutions.

Size and Age

The Agency considered the impact of size and age on the segmentation of cold worked pipe and tube mills. Size has no apparent effect upon segmentation. Analysis failed to reveal any correlation between the size of a pipe and tube mill and process water usage. Figure IV-1 is a plot of discharge flow (in gallons/ton)versus size (expressed as capacity in tons/day) for cold worked pipe and tube mills using water. (No figure is provided for cold working mills using soluble oil solutions, as more than 90% of these mills currently achieve the proposed BPT limitations of zero discharge.) Also shown on this plot is the BPT effluent discharge rate. As can be seen by the plot, the size of a pipe and tube mill has no bearing upon the ability to recycle and subsequently attain the BPT discharge flow rate. Thus, the Agency concluded that further segmentation based upon the size of cold worked pipe and tube mills is not appropriate.

The Agency next examined age as a possible basis for further segmentation. According to DCP data, the oldest mill now in operation was built in 1925, and the newest was built in 1978. The Agency compared discharge flow versus age in a manner similar to the discharge flow versus size comparison noted above, and this comparison is illustrated in Figure IV-2. As with the flow versus size plot, no relationship between age and process flow is evident. (A figure is not provided for the cold worked mills using soluble oil solutions, as more than 90% of these mills currently achieve the proposed BPT limitations of zero discharge.) Hence, the Agency concludes that the age of a mill has no effect on the ability to treat and recycle process wastewaters. Further analysis also indicated that mill age does not affect wastewater quantity.

The Agency also addressed the issue of retrofitting pollution control equipment as part of its plant age analysis. The ability to retrofit pollution control equipment has been demonstrated at several plants. These plants serve to illustrate that pollution control equipment can be retrofitted on existing production facilities without unreasonable difficulty or expense. In addition, the Agency analyzed the cost of retrofit, to determine whether older plants require additional capital expenditures for the installation of pollution control equipment over that required for new plants. The D-DCPs solicited this retrofit cost information. Since the industry indicated that no retrofit costs were incurred for the survey mills, the Agency concludes that the cost of retrofitting pollution control equipment on older mills is either minimal or not significant.

Based upon the preceding discussion, the Agency believes that neither the size nor age of a cold worked pipe and tube mill has any significant effect upon the nature or treatment of its wastewaters. Accordingly, the Agency concludes that further subdivision or segmentation based upon size or age is not appropriate.

Geographic Location

The location of cold worked pipe and tube plants has no apparent effect upon segmentation. The Agency analyzed the relationship between mill location and process water use. No discernible pattern was revealed. Most pipe and tube mills are located in twelve states east of the Mississippi River and in Texas, California, Colorado, Utah, and Louisiana. It should be noted that cold worked mills using water achieve zero discharge, and cold worked mills using soluble oil solutions have a minimal blowdown which is disposed of by hauling at the BPT level. Thus, both readily attain minimal water use conditions.

Process Water Usage

DCP and D-DCP data, as well as sampled plant data, were used in determining the applied and discharge flow rates (gal/ton) for each mill. Flow averages and ranges in each of the two cold worked mill subdivisions are presented in Table IV-1. The flow differences among the types of cold worked pipe and tube mills can be readily noted on this table. Processs water usage, therefore, is a consideration in cold worked pipe and tube mill segmentation.

TABLE IV-1

FLOW AVERAGES AND RANGES
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE

(All flows expressed in gal/ton)

	Applied Flow		Discharge Flow	
	Average (1)	Range (2)	Average (1)	Range (2)
Cold Worked (Using Water)	2,960	320-51,483	1,895	0-26,926
Cold Worked (Using Soluble Oil Solutions)	4,769	1,143-6,000	0.54	0-1.13

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(1) Confidential information was included in average calculations.
(2) Ranges do not include confidential values.

FIGURE IV-1

DISCHARGE FLOW VS PRODUCTION CAPACITY COLD FORMING SUBCATEGORY COLD WORKING: PIPE AND TUBE (USING WATER)

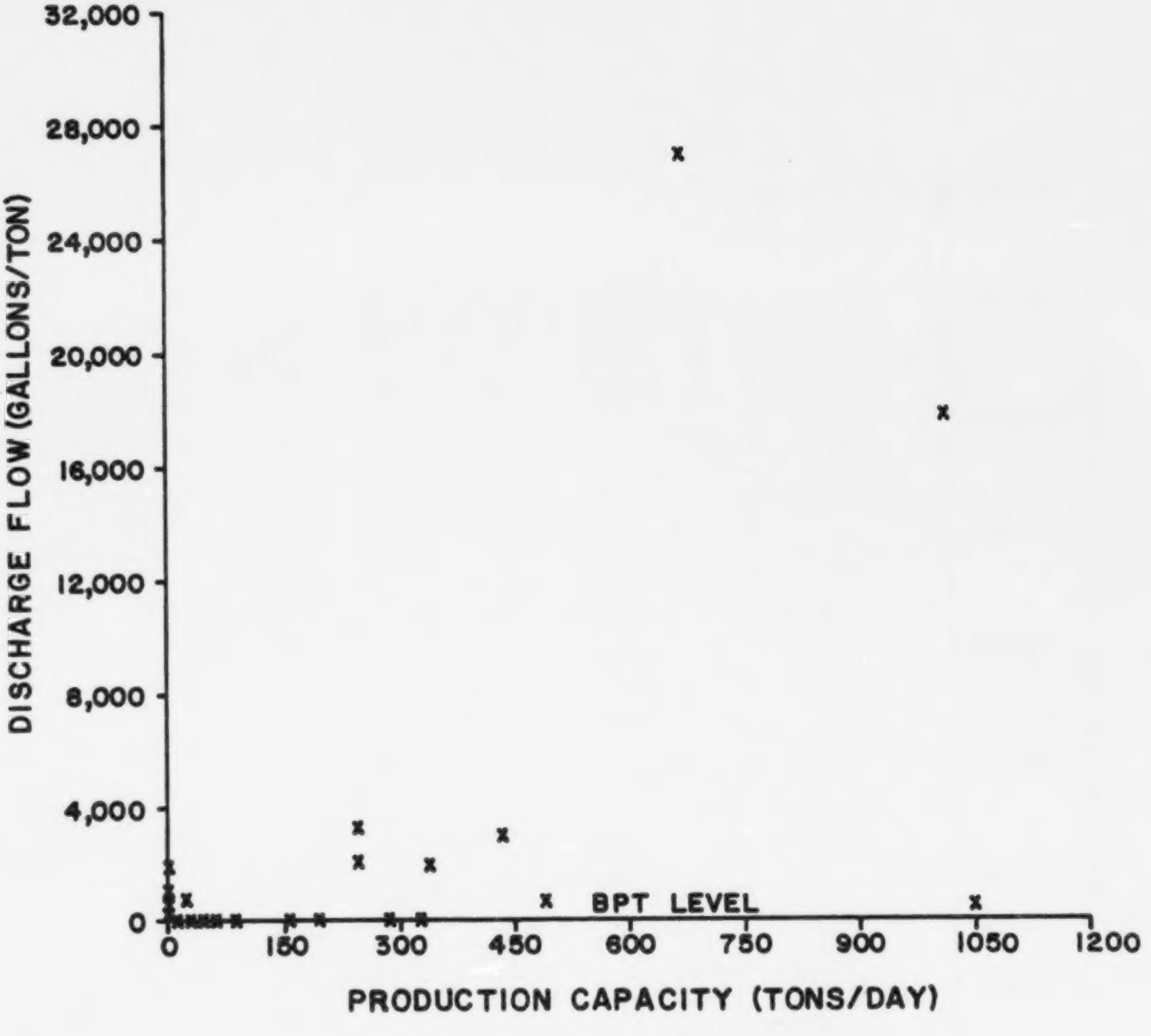
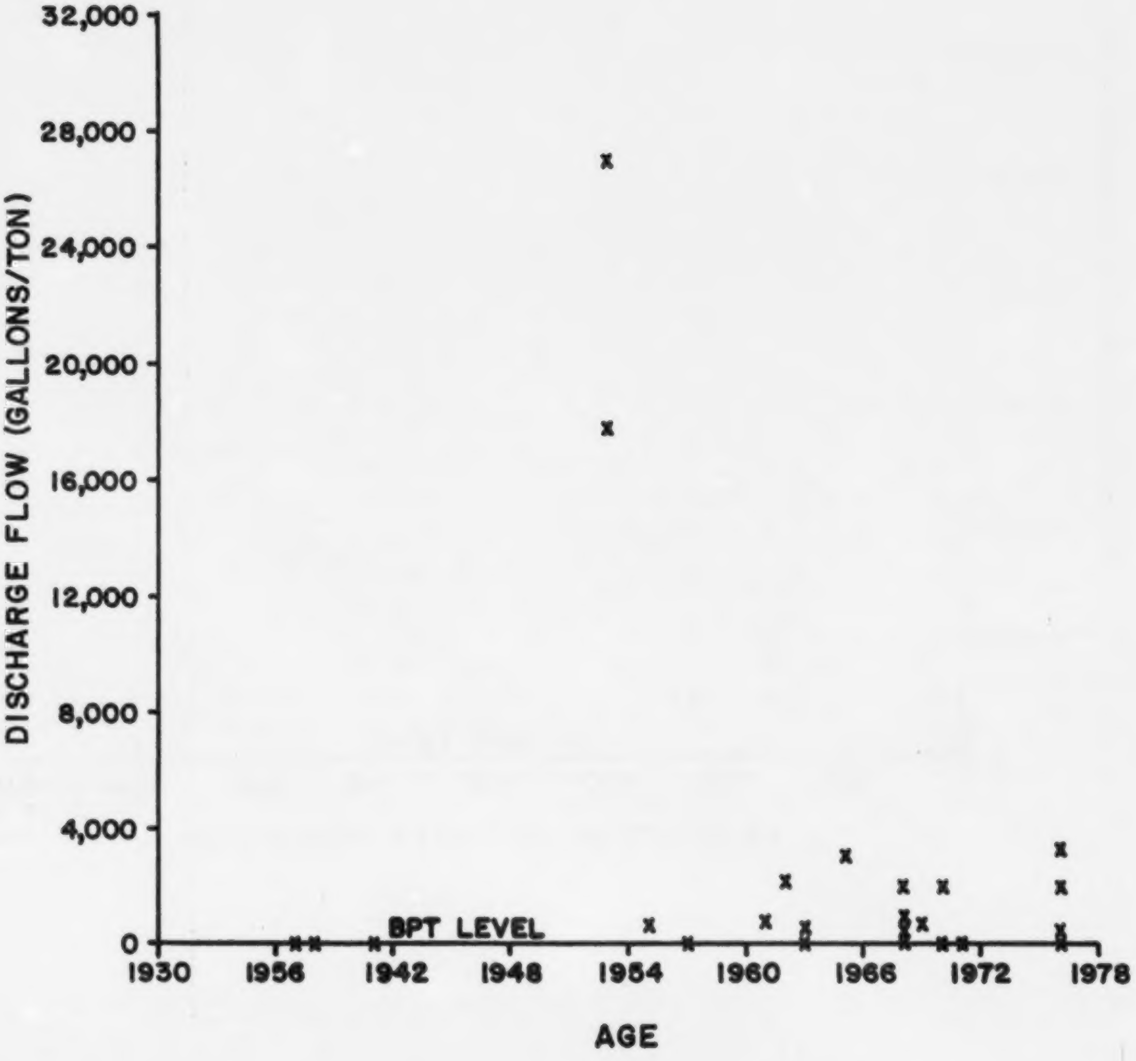


FIGURE IV-2

DISCHARGE FLOW VS AGE
COLD FORMING SUBCATEGORY
COLD WORKING: PIPE AND TUBE
(USING WATER)



COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION V

WATER USE AND WASTE CHARACTERIZATION

Introduction

Process water use and characterization of the wastewaters generated by the pipe and tube mills are the principal considerations used in determining pollutant loads, developing treatment alternatives, and estimating the cost of compliance with the proposed limitations. This section describes the wastewater systems in use in the cold worked pipe and tube subdivision and the types of wastewaters originating from the processes. The description of the wastewater systems is limited to those which come into contact with pollutants contributed by the process. This excludes the various noncontact cooling and nonprocess water systems. The limited waste characterization is based upon analytical data obtained during field sampling surveys.

Water Use

Wastewaters are generated in cold worked operations as a result of the continuous flushing of the product, welders, or rolls, either with water or soluble oil solutions. Also, wastewaters are discharged from hydrostatic testing operations.

The cold worked pipe and tube mills generally employ three main water systems.

1. Noncontact cooling water for annealing or normalizing furnaces.
2. Water or soluble oil solution cooling or lubrication systems for welders, rollers, etc.
3. Hydrostatic testing waters.

The noncontact cooling waters are handled in once-through, tight recycle, or closed loop systems, depending upon mill water availability. As noted above, the waters are noncontact and, as such, exhibit only a temperature increase and are not considered herein.

The various contact wastewaters originating in cold worked operations using water are usually discharged to trenches beneath the pipe and tube mill stands and subsequently flushed into scale pits. Scale settles out in these pits, while an oil skimming device is used to remove insoluble oils. The treated wastewater from the scale pit is recycled back to the process at most operations.

Hydrostatic test waters are typically reused in the testing of large tonnages of steels. Those wastes are small in volume, variable, and are not included in the limitations set forth herein. Limitations for those wastes should be established on a case-by-case basis.

The soluble oil solutions are continuously recycled through settling and storage tanks. In some instances, these solutions are filtered or cooled as they are recycled from the settling tank. The solids which accumulate in settling tanks are periodically removed either mechanically or by a vacuum. The solutions are recycled until they are removed for disposal by contractors.

Wastewater recycle is practiced in the two cold worked pipe and tube mill segments. Many of the mills using water and almost all of the mills using soluble oil solutions include recycle to some extent. The use of recycle is considered a good water conservation practice and, being widely demonstrated in both types of cold worked pipe and tube mill operations, has been included in the BPT and BAT model treatment systems.

In summary, the water and oil solutions used in cold worked pipe and tube mills are recycled to a high degree with only minimal blowdown from oil solution mills. This blowdown is hauled offsite for disposal for virtually all oil solution mills. Eight of seventeen water solution mills have no discharge. Based on the above, the Agency believes that zero discharge is attainable for all cold worked pipe and tube mills, and is, in fact, proposing such limitations at the BPT level. Hence, those wastes have not been studied in great detail.

Waste Characterization

The cold worked process using water and cold worked process using soluble oil solutions both generate a fine scale as well as insoluble and water soluble oils and greases. Free oils and greases are present in both types of mill wastes as a result of oil spills, line breaks, excessive dripping of lubricants, and equipment washdown. In addition, water soluble and emulsified oils are found in the mill soluble oil solutions. The pH of cold worked pipe and tube wastewaters may be slightly acidic due to prior pickling operations.

Table V-1 presents the available raw waste data for cold worked pipe and tube mills using water. These concentrations have served as the bases for pollutant load reduction calculations summarized in Section VIII. Based upon the data available, the Agency has been unable to determine whether or not toxic pollutants are present in wastewaters from cold worked pipe and tube operations using water. At this time, the Agency is continuing its investigation of these wastewaters.

Since similar oil solutions are used in both cold rolling and cold worked pipe and tube operations, similar pollutants are expected in all cold worked wastewaters. Reference is made to the cold rolling report for a description of cold rolling waste solutions. Data from cold rolling plants have served as the bases for pollutant load reduction calculations for pipe and tube operations which use soluble oil solutions. These calculations are summarized in Section VIII.

TABLE V-1

SUMMARY OF ANALYTICAL DATA FROM THE SAMPLED PLANT
ORIGINAL GUIDELINES SURVEY
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

(Net Concentrations (mg/l) of Pollutants in Raw Wastewaters)

Reference Code	0492A
Plant Code	HH-2
Sample Points	1-2
Applied Flow (gal/ton)	1920
Suspended Solids	19
Oil and Grease	61.3

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION VI

WASTEWATER POLLUTANTS

As noted in Section V, the Agency believes that zero discharge of process wastes can be achieved at all cold worked pipe and tube operations. As this level of treatment is being proposed at the BPT level, the Agency has not selected specific pollutants for limitation. However, in order to provide estimates of the pollutant loads removed, suspended solids and oil and grease concentrations have been used for those plants using water solutions. For those plants using soluble oil solutions, concentrations of toxic organics have been used in addition to the TSS and oil and grease concentrations to calculate pollutant loads. The sources of these concentration data are referenced in Section V of this report.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

This section presents the treatment practices currently used within the cold worked pipe and tube subdivision. Data from DCPs and a plant visit provide the basis for the summary of treatment technologies used for cold worked mills. Available information shows the level of effluents achievable through the various treatment systems.

To develop the technology, propose limitations, and estimate incremental costs associated with the application of the technologies designated as possible treatment approaches, it was necessary to determine the levels of treatment in existence within this subdivision. The alternative treatment systems developed and the corresponding effluent characteristics are summarized in Sections IX through XIII. The costs are summarized in Section VIII.

Control and Treatment Technology

Summary of Treatment Practices Currently Employed at Cold Worked Pipe and Tube Plants

The treatment provided by most pipe and tube plants consists of sedimentation (primarily by scale pits), oil removal (by skimming), and recycle. Following is a description of the various treatment technologies employed by cold worked pipe and tube operations (see Tables III-1 and III-2 for treatment technologies used by the individual mills).

A. Cold Worked Pipe and Tube Plants Using Water

1. Sedimentation-Primary Scale Pit

   The primary scale pit serves to collect the heavier suspended particulate matter and allows tramp oils to float to the surface. Approximately 45% of the pipe and tube plants using water have a primary scale pit.

2. Oil Skimmer

   Oil skimmers are used to remove the tramp oils which accumulate in the scale pits. Approximately 35% of the pipe and tube plants using water have some type of oil skimming equipment.

3. Recycle

Recycling all or part of the process waters conserves water use. Approximately 45% of these plants recycle all or part of their process water.

B. Cold Worked Pipe and Tube Plants Using Soluble Oil Solutions

1. Sedimentation-Primary Scale Pit

Approximately 57% of these plants use primary scale pits to provide for the collection of particulate matter and insoluble oil.

2. Oil Skimming

Approximately 7% of these plants use some type of oil skimming device to remove insoluble oils.

3. Recycle

Approximately 93% of these plants recycle a large percentage of process solutions.

4. Contractor Removal

A small fraction of the oil solution is not recycled but is hauled off-site by a contractor. About 86% of the plants dispose of spent oil solutions in this manner. The spent oil solution from one plant is disposed of by ground application.

Plant Visit Analytical Data

One cold worked pipe and tube mill using water was visited during the original guidelines survey. Table VII-1 presents a summary of the raw and effluent analytical data from that sampled cold worked mill. Table VII-2 provides a legend for the various control and treatment technology abbreviations used in the above tables and in other tables throughout this report.

Cold worked pipe and tube mills using soluble oil solutions were not visited during either survey.

Plant Visit

Plant HH-2 - Figure VII-1

Plant HH-2 is a cold worked mechanical tubing mill. The tubing mill wastewaters discharge to a settling and cooling basin which receives wastes from other mill operations such as open hearths and rolling mills. The settling basin overflow is directed into another similar basin and then to oil skimming facilities. The effluent is then pumped to a large reservoir from which all of the water is reused.

However, if the reservoir is full, treated effluent, after oil skimming, is discharged to a receiving stream.

TABLE VII-1

SUMMARY OF ANALYTICAL DATA FROM THE SAMPLED PLANT
ORIGINAL GUIDELINES SURVEY
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

Raw Wastewater

Reference Code		0492A	
Plant Code		HH-2	
Sample Point		1	
Flow (gal/ton)		1920	
	mg/l		lbs/1000 lbs
Suspended Solids	23		0.184
Oil and Grease	63.3		0.507
pH		5.8	

Effluent

Sample Point		2	
Flow (gal/ton)		1910	
C&TT		Settling Lagoon, Skimmer	
	mg/l		lbs/1000 lbs
Suspended Solids	4		0.032
Oil and Grease	2		0.016
pH		6.2	

TABLE VII-2

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. Operating Modes

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. Control Technology

10.	DI	Deionization
11.	SR	Spray/Fog Rinse
12.	CC	Countercurrent Rinse
13.	DR	Drag-out Recovery

C. Disposal Methods

20.	H	Haul Off-Site
21.	DW	Deep Well Injection

TABLE VII-2
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

TABLE VII-2
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 3

D. Treatment Technology (cont.)

43.	FLt	Flocculation, where t = type t: L = Lime A = Alum P = Polymer M = Magnetic O = Other, footnote
44.	CY	Cyclone/Centrifuge/Classifier
44a.	DT	Drag Tank
45.	CL	Clarifier
46.	T	Thickener
47.	TP	Tube/Plate Settler
48.	SLn	Settling Lagoon, where n = days of retention time
49.	BL	Bottom Liner
50.	VF	Vacuum Filtration (of e.g., CL, T> or TP underflows)
51.	Ft,m,h	Filtration, where t = type m = media h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52.	CLt	Chlorination, where t = type t: A = Alkaline B = Breakpoint
53.	CO	Chemical Oxidation (other than CLA or CLB)

TABLE VII-2
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 4

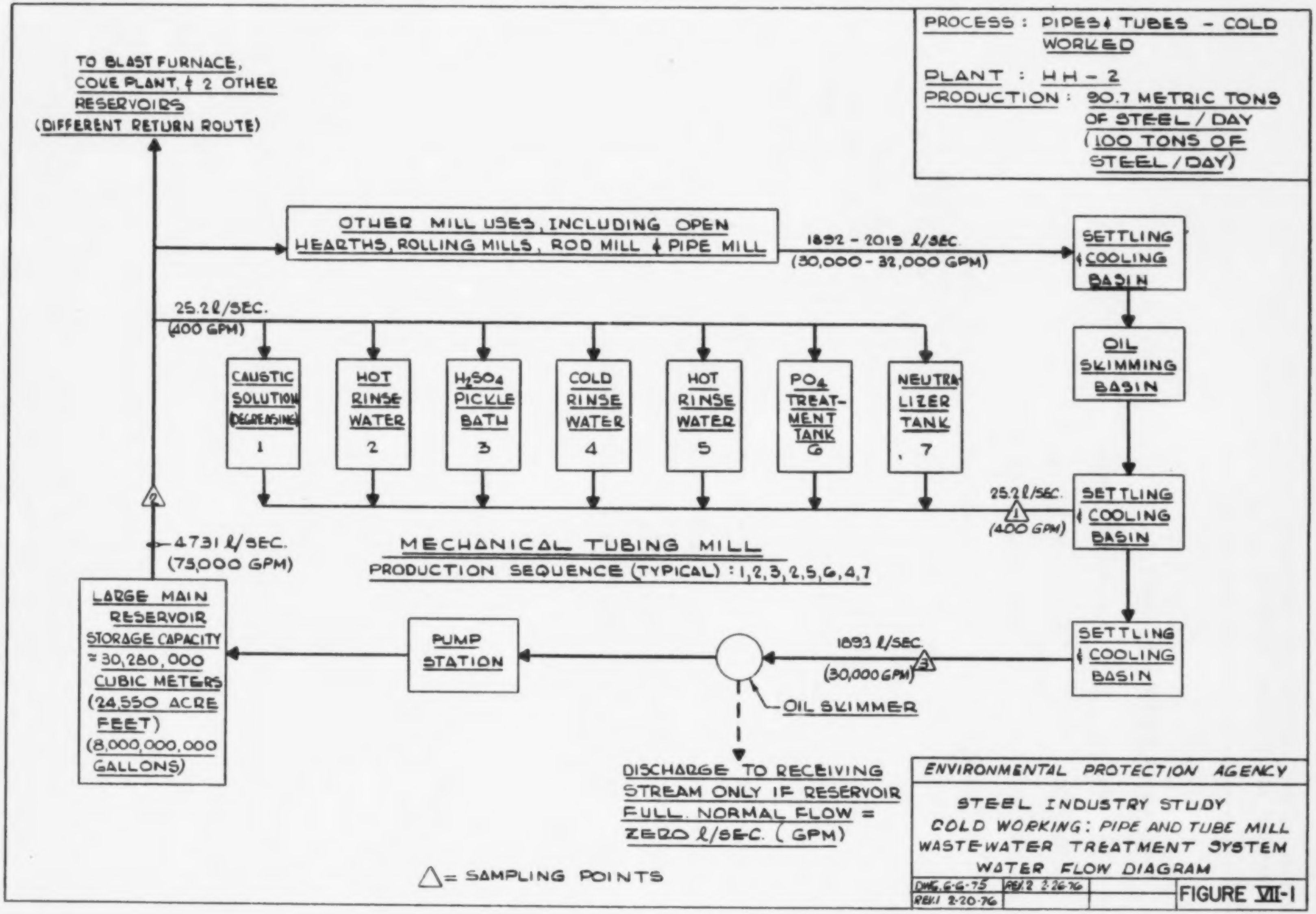
D. Treatment Technology (cont.)

54.	BOt	Biological Oxidation, where t = type t: An = Activated Sludge n = No. of Stages T = Trickling Filter B = Biodisc O = Other, footnote
55.	CR	Chemical Reduction (e.g., chromium)
56.	DP	Dephenolizer
57.	ASt	Ammonia Stripping, where t = type t: F = Free L = Lime C = Caustic
58.	APt	Ammonia Product, where t = type t: S = Sulfate N = Nitric Acid A = Anhydrous P = Phosphate H = Hydroxide O = Other, footnote
59.	DSt	Desulfurization, where t = type t: Q = Qualifying N = Nonqualifying
60.	CT	Cooling Tower
61.	AR	Acid Regeneration
62.	AU	Acid Recovery and Reuse
63.	ACt	Activated Carbon, where t = type t: P = Powdered G = Granular
64.	IX	Ion Exchange
65.	RO	Reverse Osmosis
66.	D	Distillation

TABLE VII-2
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AAl	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide


PROCESS : PIPES & TUBES - COLD WORKED
PLANT : HH - 2
PRODUCTION : 90.7 METRIC TONS OF STEEL / DAY (100 TONS OF STEEL / DAY)
TO BLAST FURNACE, COKE PLANT, & 2 OTHER RESERVOIRS (DIFFERENT RETURN ROUTE)
OTHER MILL USES, INCLUDING OPEN HEARTHS, ROLLING MILLS, ROD MILL & PIPE MILL
1892 - 2019 ℓ/SEC. (30,000 - 32,000 GPM)
SETTLING & COOLING BASIN
OIL SKIMMING BASIN
25.2 ℓ/SEC. (400 GPM)
CAUSTIC SOLUTION (DEGREASING) 1
HOT RINSE WATER 2
H2SO4 PICKLE BATH 3
COLD RINSE WATER 4
HOT RINSE WATER 5
PO4 TREAT-MENT TANK 6
NEUTRA-LIZER TANK 7
25.2 ℓ/SEC. (400 GPM)
1
SETTLING & COOLING BASIN
2
4731 ℓ/SEC. (75,000 GPM)
MECHANICAL TUBING MILL
PRODUCTION SEQUENCE (TYPICAL) : 1,2,3,2,5,6,4,7
LARGE MAIN RESERVOIR STORAGE CAPACITY ≈ 30,280,000 CUBIC METERS (24,550 ACRE FEET) (8,000,000,000 GALLONS)
PUMP STATION
1893 ℓ/SEC. (30,000 GPM)
3
SETTLING & COOLING BASIN
OIL SKIMMER
DISCHARGE TO RECEIVING STREAM ONLY IF RESERVOIR FULL. NORMAL FLOW = ZERO ℓ/SEC. (GPM)
△ = SAMPLING POINTS
DWG. 6-6-75 REV.2 2-26-76
REV.1 2-20-76

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD WORKING: PIPE AND TUBE MILL
WASTE-WATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-1

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION VIII

COST, ENERGY, AND NONWATER QUALITY IMPACTS

Introduction

This section addresses the cost, energy, and nonwater quality impacts of applying different levels of pollution control technology to cold worked pipe and tube operations. The following topics are discussed: actual treatment costs incurred by plants surveyed; the treatment technologies and systems recommended for use in the cold worked pipe and tube subdivision; and the cost, energy, and other nonwater quality impacts associated with the application of BPT, BAT, BCT, NSPS, PSES, and PSNS. In addition, air pollution, solid waste disposal, and consumptive use of water impacts are addressed.

Actual Costs Incurred By the Plant Surveyed for This Study

The water pollution control costs for the plant surveyed during this study are presented in Table VIII-1. These costs were derived from data presented in response to the D-DCPs. The costs have been adjusted to July 1978 dollars.

Control and Treatment Technology

The treatment components and systems recommended for use are presented in Tables VIII-2 and VIII-3. These tables provide a basic summary of the treatment technologies which comprise the treatment models for the cold worked pipe and tube subdivision of the cold forming subcategory.

On these C&TT summary tables, the following items are described for each step:

1. Treatment and/or control methods employed
2. Status and reliability
3. Problems and limitations
4. Implementation time
5. Land requirements
6. Environmental impacts other than water
7. Solid waste generation and primary constituents

Cost, Energy, and Nonwater Quality Impacts

General Information

The installation of BPT, BCT, BAT, NSPS, PSES, and PSNS systems may require additional expenditures in terms of costs and energy and may affect solid waste disposal and water consumption. The Agency estimated costs and energy requirements on the bases of alternative treatment systems developed in Sections IX through XIII of this report. These costs and energy requirements are presented in this section.

Estimated Costs for the Installation of Pollution Control Technologies

A. Cost Required to Achieve the Proposed BPT Limitations

In order to develop BPT compliance costs, the Agency developed BPT model treatment systems sized to represent the average cold worked pipe and tube plants found in the United States. Separate models were necessary for the water and soluble oil mill processes. The model sizes (tons/day) were developed on the basis of the average production capacities of water and soluble oil plants. The treatment model applied flows were also developed using industry average flow values. The components and effluent flows discussed in Section IX were then incorporated to complete the development of the treatment models.

Some plants will have to incur additional capital and operating costs to attain the proposed BPT limitations. The BPT model costs are presented in Tables VIII-4 and VIII-5. However, not all plants will incur all of these cost outlays, as many are already operating at or near BPT. To obtain a more accurate accounting of costs required for BPT, a capital cost tabulation was performed for all pipe and tube mills. The tabulations, presented in Tables VIII-6 and VIII-7, involve the application of the model costs to each mill in both process subdivisions. These tabulations summarize the treatment installed at each mill and estimate the amount of money already expended and the costs yet required to attain BPT.

The Agency estimates the capital costs of the BPT model treatment system for all cold worked pipe and tube plants using water to be $7.1 million. Of this total, $3.9 million is currently in place and $3.2 million is associated with technology which remains to be installed. The estimated industry annual operating cost of the proposed BPT limitations for cold working pipe and tube (using water) wastewaters is $1.8 million.

The Agency estimates the capital costs of the BPT model treatment system for all of the cold worked pipe and tube plants using soluble oil solutions to be $1.1 million. All of the necessary technology is currently in place. The estimated industry wide annual operating cost of the BPT limitations for cold worked pipe and tube (using soluble oil solutions) wastewaters is $1.1 million.

B. Costs Required to Achieve the BAT Limitations

The Agency is currently investigating the quality of wastewaters from cold worked pipe and tube operations using water. If this investigation reveals the presence of toxic pollutants in these wastewaters, a BAT limitation of zero discharge will be promulgated for these operations. Since zero discharge is proposed at BPT for pipe and tube operations using water, no additional expense would be incurred at BAT. Refer to Table VIII-4 for BPT model cost information.

The proposed BAT limitations for cold worked pipe and tube operations using soluble oil solutions are identical to the corresponding proposed BPT limitations. Therefore, no additional expense is incurred at BAT. Refer to Table VIII-5 for BPT model cost information.

C. Cost Required to Achieve the BCT Limitations

The proposed BCT limitations for both types of cold worked pipe and tube plants are equal to the corresponding proposed BPT limitations. Therefore, no additional costs beyond BPT will be incurred. Pipe and tube plants using water have been limited to zero discharge at BPT. Similarly, it has been proposed that those plants using soluble oil solutions discharge waste solutions by contract hauling. Refer to Tables VIII-4 and VIII-5 for BPT model cost information.

D. Costs Required to Achieve NSPS

New source performance standards apply to those facilities which are constructed after the proposal of these standards. NSPS for pipe and tube operations using water are proposed at zero discharge. On a model plant basis, the estimated capital cost of NSPS technology is $0.5 million. The corresponding annual cost is about $0.09 million.

The Agency considered two alternative treatment systems for plants using soluble oil solutions. The first alternative is identical to the corresponding BPT model treatment system. On a plant basis, the estimated capital cost of NSPS technology is $0.42 million, while the annual cost is approximately $0.08 million. The second alternative is discussed in Section XII. The corresponding costs for this alternative are presented in Table VIII-8.

E. Costs Required to Achieve the Pretreatment Standards

At this time, no specific pretreatment standards are being proposed for cold worked pipe and tube plants using water. Instead, the Agency is referencing "General Pretreatment Regulations" for these operations. However, if the Agency's current investigation reveals the presence of toxic pollutants in these wastewaters, PSES/PSNS will be set equal to zero discharge. Should a zero discharge standard be set at PSES/PSNS, the pretreatment costs will be the same as the corresponding BPT costs. Refer to Table VIII-4.

The proposed standard for new and existing pipe and tube plants using soluble oil solutions is equal to the proposed BPT zero discharge limitation for plants using oil. Therefore, the pretreatment costs will be the same as the corresponding BPT costs. Refer to Table VIII-5.

Energy Impacts Due to the Installation of the Model Technologies

Moderate amounts of energy are required by the various levels of treatment in the cold worked pipe and tube subdivision of the cold forming subcategory. All of the energy expenditures occur at the BPT treatment level for those plants using water and for those plants using soluble oil solutions which haul wastes. For new plants using oil, which treat wastewaters rather than haul off-site, the major energy expenditures will occur at the NSPS and PSNS levels of treatment.

A. Energy Impacts at BPT

The estimated energy requirements are based upon the assumption that treatment systems similar to the treatment models presented in this report are installed. On this basis, the energy use for the BPT model treatment systems for all pipe and tube plants using water is estimated at 160,000 kilowatt-hours of electricity per annum. Similarly, the energy use for the BPT model treatment system for all pipe and tube plants using soluble oil solutions is estimated at 112,000 kilowatt-hours of electricity per annum. Both estimates represent insignificant percentages of the 57 billion kilowatt-hours used by the steel industry in 1978.

B. Energy Impacts at BAT

If the Agency's current investigation reveals the presence of toxic pollutants in wastewaters from cold worked pipe and tube mills using water, BAT for these operations will be promulgated at zero discharge. Since zero discharge is also proposed at BPT for pipe and tube operations using water, no energy expenditures in excess of those incurred at BPT would be required.

As the BAT alternative treatment system for pipe and tube plants using soluble oil solutions is identical to the corresponding BPT model, no energy expenditures in excess of those incurred at BPT are required.

C. Energy Impacts at BCT

As the two BCT alternative treatment systems are identical to the two corresponding BPT models, no energy expenditures in excess of those incurred at BPT are required.

D. Energy Impacts at NSPS

The energy requirements for the NSPS models follow. The Agency did not estimate the energy impacts for NSPS since a determination of the number of new pipe and tube plants which will open was not made as part of this study.

For those pipe and tube plants using water, NSPS is proposed to be zero discharge. The treatment system presented is identical to the BPT model treatment system for water plants. On a per plant basis, this treatment model will use 8,000 kilowatt-hours of electricity per year.

For those pipe and tube plants using soluble oil solutions, the energy requirements follow for the two NSPS alternatives.

Model	kw-hr per year
NSPS-1	8,000
NSPS-2	44,000

E. Energy Impacts at Pretreatment

The energy impacts for the pretreatment models follow. The Agency did not estimate the energy impacts for PSNS since a determination of the number of new pipe and tube plants which will discharge to POTWs was not made as part of this study.

At this time, no specific pretreatment standards are being proposed for cold worked pipe and tube plants using water. Instead, the Agency is referencing the "General Pretreatment Regulations" for these operations. However, if the Agency's current investigation reveals the presence of toxic pollutants in these wastewaters, PSES/PSNS will be equal to zero discharge. A zero discharge pretreatment model would use 8,000 kilowatt-hours of electricity per year.

For those pipe and tube plants using soluble oil solutions, the PSES and PSNS energy requirements (on a per plant basis) would be 8000 kilowatt-hours per year.

Nonwater Quality Impacts

In general, the Agency expects that the nonwater quality impacts associated with the proposed treatment technologies will be minimal. The three impacts evaluated are air pollution, solid waste disposal, and water consumption.

A. Air Pollution

No air pollution impacts are expected to occur for cold worked pipe and tube mills as a result of the installation of the treatment models.

B. Solid Waste Disposal

The treatment steps incorporated in the BPT model treatment systems will generate quantities of solids and oils and greases. A summary of the solid waste generation for all pipe and tube operations at the proposed BPT level of treatment follows.

Treatment Level	Solid Waste Generation Cold Worked Pipe and Tube Plants (Tons/Year)
BPT Using Water	1,443
BPT Using Soluble Oils	17,800

If the Agency's current investigation of pipe and tube operations using water reveals the presence of toxic pollutants in these wastewaters, BAT will be promulgated at zero discharge. A zero discharge BAT model would not generate additional solid waste beyond the quantity generated at BPT.

The BAT level of treatment for cold worked pipe and tube plants using soluble oils will not generate additional solid waste beyond the quantity generated at BPT.

Following are the estimated amounts of solid wastes generated by the NSPS and Pretreatment models.

NSPS for cold worked pipe and tube plants using water has been set at zero discharge. This NSPS model will generate 72 tons/year of solid waste. At this time, no specific pretreatment standards are being proposed for cold worked pipe and tube plants using water. Instead the Agency is referencing the "General Pretreatment Regulations" for these operations. However, if the Agency's current investigation reveals the presence of toxic pollutants in these wastewaters, PSES/PSNS will be equal to zero discharge. A zero discharge pretreatment model would also generate 72 tons/year of solid waste.

The estimated amounts of solid wastes generated by the NSPS and Pretreatment models for cold worked pipe and tube mills using soluble oil solutions follow.

Treatment Level	Solid Waste Generation Treatment Model (Tons/Year)
NSPS-1	91
NSPS-2	91
PSES/PSNS	91

C. Water Consumption

No significant water consumption is expected to occur for cold working pipe and tube mills as a result of the installation of the proposed treatment systems.

Summary of Impacts

The Agency concludes that the effluent reduction benefits described below for the cold worked pipe and tube subdivision justify any adverse impacts associated with energy consumption, air pollution, solid waste disposal, or water consumption.

	Effluent Discharge (Tons/Year)		
	Raw Waste[1]	Proposed BPT	Proposed BAT
Using Water			
Flow, MGD	29.6	0	0[2]
TSS	802	0	0[2]
Oil & Grease	2,086	0	0[2]
Using Soluble Oil Solutions			
Flow, MGD	18.0	0	0
TSS	19,550	0	0
Oil & Grease	1,955,000	0	0
Total Organics	541.5	0	0

[1] Raw waste loadings are based upon estimated concentrations from cold rolling (oil) and analytical data (water).

[2] If the Agency's current investigation reveals the presence of toxic pollutants in these wastewaters, BAT will be promulgated at zero discharge.

TABLE VIII-1

EFFLUENT TREATMENT COSTS
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OIL SOLUTIONS)

(All costs are expressed in July, 1978 dollars)

Reference Code	0240B
Initial Investment Cost	13,390
Annual Costs	
Cost of Capital	1,340
Depreciation	670
Operation and Maintenance	235
Energy, Power, Chemicals, etc.	35
Other	210
TOTAL	2,490
$/Ton	1.93

NOTE: All cost values were taken from the D-DCP.

TABLE VIII-2

CONTROL AND TREATMENT TECHNOLOGIES
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Scale pit with clam shell - Provides for primary settling of the majority of solid waste. Solids are removed by clam shell.	Very reliable, widely used in this and other related subcategories.	Accumulated solids must be periodically removed.	6-8 months	15'x20'	Accumulated solids must be disposed of properly.	Generates relatively dry sludge.
B. Surface skimmer - Removes oils and greases from the surface of the wastewater.	Widely used in this subcategory and throughout the steel industry.	Hydraulic overload or surface turbulence will reduce effectiveness.	3 months	No additional land required.	The skimmed oils and greases must be disposed of properly.	Generates oils and greases.
C. Recycle - The total flow from the filter is returned to the process.	Widely used in this and other related subcategories.	Potential for scaling, plugging or fouling due to increasing concentrations of dissolved solids in the recycled water. The pumps require maintenance.	12-14 months	25'x25'	None	None

TABLE VIII-3

CONTROL AND TREATMENT TECHNOLOGIES
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OILS)

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Scale pit with clam shell - Provides for primary settling of the majority of solid wastes. Solids are removed by clam shell.	Very reliable, widely used in this and other related subcategories.	Accumulated solids must be periodically removed.	6-8 months	16'x22'	Accumulated solids must be disposed of properly.	Generates relatively dry sludge.
B. Surface skimmer - Removes tramp oils and greases from surface of solutions.	Widely used in this subcategory and throughout the steel industry.	Hydraulic overload or surface turbulence will reduce effectiveness.	3 months	No additional land required.	The skimmed oils and greases must receive proper disposal.	Generates oils and greases.
C. Recycle - Virtually all process flow is recycled.	Most plants recycle their solutions.	Much maintenance is required.	12-14 months	25'x25'	None	None
D. Storage tank and contractor removal - spent oil solution is stored and hauled off-site as required.	This method is used by more than 90% of the mills in this subcategory.	None	-	-	-	-
E. Equalization tank - Collects and stores the wasteload for future batch treatment.	Practiced throughout the steel industry.	None	*	*	None	None
F. Acid addition - Acid is added in a reactor vessel to break the oil emulsion.	Practiced in related subcategories.	Increased cost unless source of acid exists at plant.	*	*	None	None
G. Alum addition - Alum is used in conjunction with Step E to aid in breaking the oils.	Practiced in related subcategories.	Increased chemical costs.	*	*	None	None

TABLE VIII-3
CONTROL AND TREATMENT TECHNOLOGIES
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING SOLUBLE OILS)
PAGE 2

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
H. Lime addition - Lime neutralizes the wastes in the flocculator mixing tank.	Practiced in related subcategories.	Increased chemical costs. This step generates a significant solids loading that cannot be discharged without further treatment.	*	*	None	Produces significant quantities of sludge that is of a consistency which is difficult to dispose of.
I. Poly addition - Poly is added to waste solution in conjunction with Step G to promote settling.	Practiced throughout the steel industry. Reliable coagulation method.	Increased chemical costs.	*	*	None	No significant amount of sludge is generated.
J. Air flotation - Suspended or oily materials rise to the surface attached to air bubbles.	Practiced in related subcategories.	Requires care not to disturb flotants prior to removal.	*	*	Possibility of obnoxious gases in immediate area surrounding the unit.	Oils recovered from flotation unit may be able to be reused. If not, they may be incinerated or disposed of in a landfill.
K. Settling basin - Additional solid waste reduction is accomplished.	Practiced throughout the steel industry.	Accumulated solids must be periodically removed.	*	*	Possibility of producing objectionable odors.	Sludges accumulated in basins must be periodically removed and disposed of properly.
L. Filtration - Treat effluent from Step J via passage through a filtration unit.	Practiced throughout the steel industry.	Increased capital and operating costs.	*	*	None	Some additional sludge will be generated when the filters are backwashed.

---

*: Since the wasteload is so small, implementation time and land requirements for Steps F through L have been combined. They total approximately one year and 50'x50'.

TABLE VIII-4

BPT MODEL COST: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming Model Size - TPD: 500
: Cold Worked Oper. Days/Year : 260
Pipe and Tube Turns/Day : 3
: (Using Water)

C&TT Step	A	B	C	Total
Treatment \$ x 10^{-3}	106	20	372	498
Annual cost \$ x 10^{-3}				
Capital	4.6	0.8	16.0	21.4
Depreciation	10.6	2.0	37.2	49.8
Operation and Maintenance	3.7	0.7	13.0	17.4
Energy and Power(1)	-	0.2	5.8(2)	0.2
Oil Disposal	-	1.4	-	1.4
TOTAL	18.9	5.1	66.2(2)	90.2

Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
Flow, gal/ton	2960	0
Total Suspended Solids	25	-
Oil and Grease	65	-
pH, Units	6-9	-

---

(1) Costs are all power unless otherwise noted.
(2) Total cost does not include power, because a credit is supplied for existing process water requirements.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Scale Pit
B: Oil Skimmer
C: Recycle

TABLE VIII-5

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Cold Forming Cold Worked Pipe and Tube (Using Soluble Oil Solutions)	Model Size - TPD: Oper. Days/Year : Turns/Day :	270 260 3

C&TT Step	A	B	C	D	Total
Investment $ x 10^{-3}	87	17	309	11	424
Annual Cost $ x 10^{-3}					
Capital	3.8	0.8	13.3	0.5	18.4
Depreciation	8.7	1.8	30.9	1.1	42.5
Operation and Maintenance	3.1	0.6	10.8	0.4	14.9
Sludge Disposal	2.1	-	-	-	2.1
Energy and Power(1)	-	0.2	4.7(2)	-	0.2
Oil Disposal	-	-	-	0.3	0.3
TOTAL	17.7	3.4	55.0(2)	2.3	78.4

Effluent Quality(3)	Raw Waste Level	BPT Effluent Level
Flow, gal/ton	4770	0
Total Suspended Solids	1000	-
Oil and Grease	10%	-
pH, Units	6-9	-

---

(1) Costs are all power unless otherwise noted.

(2) Total cost does not include power, because a credit is supplied for existing process water requirements.

(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle
D: Storage and Contract Hauling

TABLE VIII-6

BPT CAPITAL COST TABULATION

BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Worked Pipe & Tube
: (Using Water) Carbon & Specialty

Plant Code	TPD	A	B	C	In Place	Required	Total
0060	196	60	-	212	272	0	272
0060 P	7	8.2	1.5	28.7	0	38.4	38.4
0112 A	858	147	28	514	28	661	689
0112 E	1134	173	33	608	781	33	814
0176 C	23	17	3	59	59	20	79
0176 D	9	9.5	1.8	33.4	33.4	11.3	44.7
0256 F	5	-	-	23.5	23.5	0	23.5
0432 A	444	-	-	346	346	0	346
0492 A	2266	262	50	120-801	432	801	1233
0584 H	246	69	13	224-19	306	19	325
0684 A	1050	165	31	435-145	600	176	776
0856 N	435	98	18	342	116	342	458
0856 Q	1155	175	33	615	208	615	823
0864 A	489	105	20	367	125	367	492
0884 C	21	16	3	56	0	75	75
0884 E	14	12.4	2.3	43.5	0	58.2	58.2
0908	156	-	-	185	185	0	185
0908 A	612	-	-	420	420	0	420
					3934.9*	3216.9*	7151.8*

---

* Totals do not include confidential plants or dry operations.

Note: Underlined costs represent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the non-underlined portion remains to be installed.

KEY TO C&TT STEPS

A: Primary Scale Pit
B: Surface Skimming
C: Recycle 100%

TABLE VIII-7

BPT CAPITAL COST TABULATION

BASIS: 7/1/78 DOLLARS X 10^{-3}
: FACILITIES IN PLACE AS OF 1/1/78

Subcategory: Cold Forming
: Cold Worked Pipe & Tube
: (Using Soluble Oil Solutions) Carbon & Specialty

Plant Code	TPD	A	B	C	D	In Place	Required	Total
0080 A	65	-	-	-	4.7	4.7	0	4.7
0240 B	273	-	-	311	11	322	0	322
0240 C	482	-	-	437	16	453	0	453
0256 F	189	-	-	249	-	249	0	249
0856 Q	1107	-	-	-	26	26	0	26
0916 A	72	-	-	-	5	5	0	5
						1059.7*	0*	1059.7*

---

* Totals do not include confidential plants.

Note: Underlined costs represent facilities in place.

KEY TO C&TT STEPS

A: Primary Scale Pit
B. Surface Skimming
C: Recycle
D: Storage and Contract Hauling

TABLE VIII-8

NSPS ALTERNATIVE 2 COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Cold Forming
: Cold Worked Pipe and Tube
: (Using Soluble Oil Solutions)

Model Size - TPD: 270
Oper. Days/Year : 260
Turns/Day : 3

C&TT Steps	A	B	C	E	F	G	H	I	J	K	L	Total
Investment $ x 10^{-3}	87	17	309	29	33	32	34	36	33	11	44	666
Annual Cost $ x 10^{-3}												
Capital	3.8	0.8	13.3	1.2	1.4	1.4	1.5	1.6	1.4	0.5	1.9	28.8
Depreciation	8.7	1.8	30.9	2.9	3.3	3.2	3.4	3.6	3.3	1.1	4.4	66.6
Operation and Maintenance	3.1	0.6	10.8	1.0	1.1	1.1	1.2	1.3	1.2	0.4	1.5	23.3
Sludge Disposal	2.1	-	-	-	-	-	-	-	0.2	-	-	2.3
Energy & Power(1)	-	0.2	4.7(2)	0.1	0.1	0.1	0.1	0.2	0.2	-	0.1	1.1
Chemical Costs	-	-	-	-	Nil	Nil	Nil	Nil	-	-	-	-
Oil Disposal	-	-	-	-	-	-	-	-	0.3	-	-	0.3
TOTAL	17.7	3.4	55.0(2)	5.2	5.9	5.8	6.2	6.7	6.6	2.0	7.9	122.4

Effluent Quality(3)	NSPS Feed Level	NSPS Effluent Level
Flow, gal/ton	4770	0.5
Suspended Solids	1000	15
Oil and Grease	10%	5
pH	6-9	6-9

---

(1) Costs are all power unless otherwise noted.
(2) Total does not include power, as a credit is supplied for existing process water requirements.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Scale Pit with Clam Shell
B: Surface Skimmer
C: Recycle
E: Equalization Tank
F: Acid Addition
G: Alum Addition
H: Lime Addition
I: Poly Addition
J: Air Flotation
K: Settling Basin
L: Filtration

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

The Best Practicable Control Technology Currently Available (BPT) limitations originally promulgated for the pipe and tube subcategory are not applicable to cold worked pipe and tube operations. As explained previously, the original limitations were developed based primarily upon hot working pipe and tube operations. The proposed BPT limitations for cold worked pipe and tube operations are reviewed below.

Identification of BPT

Based upon the information contained in Sections III through VIII of this report, the BPT model treatment systems for the cold worked pipe and tube subdivision are as follows.

A. Cold Worked Pipe and Tube Plants Using Water

The BPT model treatment system involves settling of the raw wastewater in a primary scale pit equipped with oil skimming equipment. All of the treated wastewater is then recycled back to the process. This system achieves zero wastewater discharge.

B. Cold Worked Pipe and Tube Plants Using Soluble Oil Solutions

The BPT model treatment system involves settling of the raw waste solution in a primary scale pit equipped with oil skimming equipment which removes tramp oils. A large percentage of the solution is then recycled back to the process. The spent solution is periodically removed by a contract hauler so that there is no discharge to navigable waters.

Figures IX-1 and IX-2 depict the treatment systems described above. The proposed BPT limitations do not require the installation of the model treatment systems; any treatment which achieves the proposed limitations is acceptable.

Rationale for BPT Treatment Systems

As noted in Section VII, each of the components in the BPT model treatment systems is demonstrated at a large number of cold worked operations.

Justification of Proposed BPT Limitations

The proposed BPT limitation for cold worked pipe and tube plants using water is zero discharge. Justification of this limitation is presented in Table IX-1.

It is proposed that the discharge flow of 0.5 gal/ton, from cold worked pipe and tube plants using soluble oils, be periodically hauled off-site for disposal, so there will be no discharge from cold worked operations to navigable waters. Approximately 86% of the cold worked pipe and tube plants using soluble oils presently have spent oil solutions hauled off-site for disposal. Incineration is another method of disposal of spent oil solutions which achieves the zero discharge limitation.

TABLE IX-1

SUMMARY OF FLOWS AND BPT JUSTIFICATION
COLD FORMING SUBCATEGORY
COLD WORKED - PIPE AND TUBE (USING WATER)

Plant Reference Code	Discharge Flow (gal/ton)	Basis
0060 (01-08)	0*	DCP
0256F(04-06)	0*	DCP
0432A(05)	0*	DCP
0684K(01)	0*	DCP
0684K(03-07)	0*	DCP
0908	0*	DCP
0908A(01)	0*	DCP
0908A(02)	0*	DCP
0684A(01)	453	DCP
0864A	589	DCP
0884C	720	DCP
0492A(04)	1910	Visit
0492A(03)	2039	DCP
0856N(05)	2979	DCP
0584H	3512	DCP
0492A(01)	17731	DCP
0492A(02)	26926	DCP

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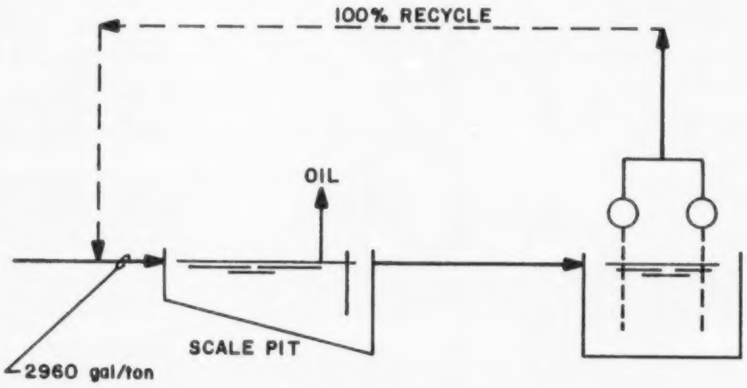
*: Flow values used in the "Average of the Best" calculation.

Average Discharge Flow: 1895
"Average of the Best" Discharge Flow: 0 gal/ton
Proposed Flow Basis: 0 gal/ton.



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKING: PIPE AND TUBE
USING WATER
BPT TREATMENT MODEL

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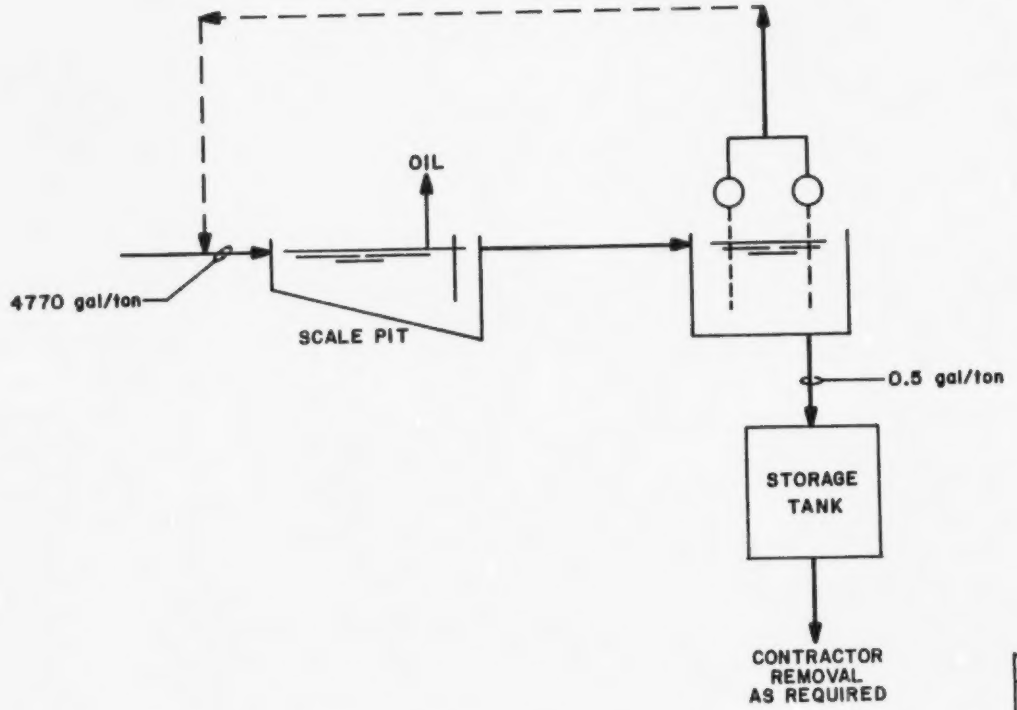
FIGURE IX-1



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKING: PIPE AND TUBE
SOLUBLE OIL SOLUTIONS
BPT TREATMENT MODEL

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FIGURE IX-2

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

The Best Available Technology Economically Achievable (BAT) effluent limitations are to be attained by July 1, 1984. BAT is determined by reviewing subcategory practices and identifying the best economically achievable control and treatment technologies employed within the subcategory. In addition, a technology that is readily transferable from another subcategory or industry may be identified as BAT.

Based upon the data available, the Agency has been unable to determine whether or not toxic pollutants are present in wastewaters from cold working pipe and tube operations using water. At this time the Agency is continuing its investigation of these wastewaters. If toxic pollutants are found, the Agency will promulgate a BAT limitation of zero discharge for cold worked pipe and tube mills using water. This technology is illustrated in Figure IX-1 and is identical to the model BPT technology.

In the BPT model treatment system, for the cold worked pipe and tube plants using soluble oil solutions, (illustrated in Figure IX-2), most of the waste solution is recycled, with a small amount collected by contract haulers for off-site disposal. This disposal could also be accomplished through incineration. The Agency is proposing a BAT limitation of zero discharge for these operations based upon the likely presence of toxic organic pollutants as described in Section V.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY

Introduction

The 1977 Amendments added section 301(b)(4)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in section 304(b) (4) - BOD, TSS, fecal coliform, and pH - and any additional pollutants defined by the Administrator as "conventional." On July 28, 1978, EPA proposed that COD, oil and grease, and phosphorus be added to the conventional pollutant list (43 Fed. Reg. 32857). Only oil and grease was added.

BCT is not an additional limitation, but replaces BAT for the control of conventional pollutants. BCT requires that limitations for conventional pollutants be assessed in light of a new "cost-reasonableness" test, which involves a comparison of the cost and level of reduction of conventional pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources. As part of its review of BAT for certain "secondary" industries, EPA proposed methodology for this cost test. (See 43 Fed. Reg. 37570, August 23, 1978).

The BCT model treatment system for cold worked pipe and tube plants using water, (illustrated in Figure IX-1), achieves zero discharge by recycling 100% of the process water. In the BCT model treatment system, for cold worked pipe and tube plants using soluble oil solutions, (illustrated in Figure IX-2) the spent oil solutions are hauled off-site. Contractor removal is a means of achieving zero discharge from those plants. Incineration in industrial boilers or furnaces is another method of achieving zero discharge of these wastes.

No BCT tests were carried out for the operations in this subdivision, because proposed BCT limitations do not incorporate further load reductions than the proposed BPT limitations. Accordingly, the Agency is proposing BCT limitations which are the same as the proposed BPT limitations.

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

A new source is defined as any source constructed after the proposal of New Source Performance Standards (NSPS). The effluent standards which must be achieved by new sources specify the degree of effluent reduction achievable through the application of the Best Available Demonstrated Control Technology (BADCT), including, where applicable, a standard permitting no discharge of pollutants. This section identifies the alternatives considered for NSPS and the resulting effluent levels for cold worked pipe and tube operations. In addition, the rationale for selection of the NSPS treatment systems, flow values, and proposed effluent standards are presented.

Identification of NSPS

Pipe and Tube Plants Using Water

The NSPS model treatment system for plants using water is identical to the BPT model treatment system corresponding to those same plants. This system, which is illustrated in Figure IX-1, consists of a scale pit, oil skimmer, and recycle mechanism. As this is a total recycle system, there is no discharge.

Pipe and Tube Plants Using Soluble Oil Solutions

A. NSPS Alternative 1

The first NSPS alternative treatment system considered for plants using oil solutions is identical to the BPT model treatment system corresponding to those same plants. This system, which is illustrated in Figure IX-2, consists of a scale pit, oil skimmer, and recycle mechanism. The entire process flow, except for 0.5 gal/ton, is returned to the process for recycle. The 0.5 gal/ton of spent oil solution is sent to a storage tank. The solutions are removed from the tank by contract hauler as required. Thus there is no discharge from cold worked operations at the plant.

B. NSPS Alternative 2

In response to industry comments, an NSPS alternative incorporating treatment and discharge of the oil solution blowdown was considered by the Agency (Figure XII-1). In this alternative, the oil solutions pass through a scale pit with an oil skimmer. Most of the oil is recycled to the process with 0.5

gal/ton directed to an equalization and storage tank, with a one week detention time, prior to further treatment. It is necessary to accumulate the waste solutions in order to provide a reasonably sized flow for the rest of the treatment cycle. However, for an eight hour treatment cycle, the flow rate remains small, only 2.0 gal/min. The first component in this cycle is a reactor into which acid and alum are added. These chemicals help break the soluble oils which are present. Lime and polymer/polyelectrolyte are then introduced in the flocculator. The lime neutralizes the solution, while the polymer/polyelectrolyte helps to coagulate the oils. An air flotation device follows which helps to raise the pollutant particles to the surface of the vessel for separation. Sludge is removed at this point. A settling basin and filter complete the treatment system by removing solids and oils which have not been separated out by the preceding treatment steps. The treated effluent is then batch discharged to a receiving stream. Because the Agency does not believe NSPS Alternative No. 2 is practicable, no effluent standards were developed based on this alternative.

Rationale for Selection of NSPS

Treatment Systems

The NSPS alternative treatment systems presented for consideration for cold worked pipe and tube plants are either similar to treatment schemes presently in use in this subdivision or have been transferred from similar operations in other cold worked metals manufacturing processes.

Flows

The applied and discharge flows developed for these NSPS models are representative of actual flows found in cold worked pipe and tube plants. Process information provided for these plants was used in developing the average values.

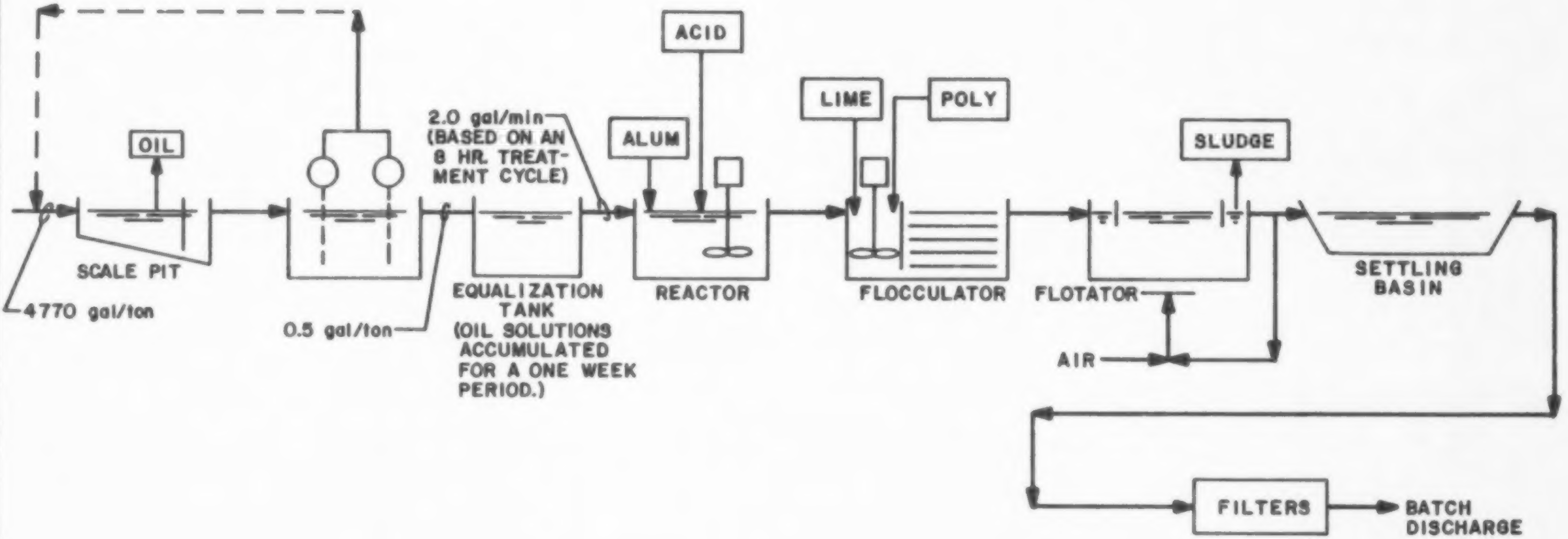
Selection of NSPS Alternative

Pipe and Tube Plants Using Water

There is only one NSPS treatment system considered, which is a zero discharge system. That system is illustrated in Figure IX-1.

Pipe and Tube Plants Using Oil

Alternative No. 1, the system illustrated in Figure IX-2, is the selected NSPS alternative for plants using soluble oil solutions. This selection was based primarily on practicality. With the second alternative, the amount of waste oil solution discharged from the recycle system for further treatment is very small. Over an eight hour period, the resulting flow rate is only 2.0 gal/min. The components used to treat this flow would be extremely small, yet they would still be costly. For these reasons, Alternative 1, in which the minimal wastes are removed by contract haulers, was chosen. As an alternative, incineration of these wastes could be accomplished in industrial boilers or furnaces. Both methods would accomplish zero discharge, the NSPS treatment level proposed for these operations.



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
COLD FORMING SUBCATEGORY
COLD WORKING: PIPE AND TUBE
SOLUBLE OIL SOLUTIONS
NSPS TREATMENT ALTERNATIVE 2

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FIGURE XII-1

COLD FORMING SUBCATEGORY

COLD WORKED PIPE AND TUBE

SECTION XIII

PRETREATMENT STANDARDS FOR COLD WORKED PIPE AND TUBE OPERATIONS DISCHARGING TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section discusses the control and treatment systems available for cold worked pipe and tube operations which discharge waste solutions to publicly owned treatment works (POTWs). Consideration has been given to the pretreatment of cold worked process waste solutions from new sources (PSNS) and from existing sources (PSES).

General Pretreatment Standards

General Pretreatment Regulations 40 CFR Part 403, are applicable to all sources. For detailed information on Pretreatment Standards refer to 43 FR 27736-27773, "General Pretreatment Regulations for Existing and New Sources of Pollution," (June 26, 1978). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards, and POTW pretreatment programs.

In establishing pretreatment standards for cold worked pipe and tube operations, the Agency gave primary consideration to the objectives and requirements of the General Pretreatment Regulations. The Agency also considered additional factors which are specifically applicable to cold worked pipe and tube operations.

The General Pretreatment Regulations set forth general discharge prohibitions that apply to all nondomestic users of a POTW to prevent pass through of pollutants, interference with the operation of a POTW, and municipal sludge contamination. The regulations also establish administrative mechanisms to ensure application and enforcement of prohibited discharge limits and categorical pretreatment standards. In addition, the Regulations contain provisions relating directly to the determination of and reporting on pretreatment standards.

POTWs are usually not designed to treat the toxic organic pollutants and emulsified oils which might be present in cold worked pipe and tube operations using soluble oil solutions. Instead, POTWs are designed to treat biochemical oxygen demand (BOD), total suspended solids (TSS), fecal coliform bacteria, and pH. Any removal of the toxic organic pollutants which a POTW might obtain is incidental to its main function of treating conventional pollutants.

In the past, POTWs have accepted pollutants in quantities much greater than their capacity for adequate treatment. As the issue of municipal sludge use has become more important, pretreatment standards must address toxic pollutant removal. The transfer of toxic pollutants to POTWs only concentrates the pollutants in sludges.

Identification of Pretreatment Standards for Existing and New Sources

A. Using Water

Available data demonstrate that many cold worked operations using water employ total recycle systems, while very few discharge to POTWs. As no toxic pollutants have yet been detected in cold worked pipe and tube operations using water, no specific pretreatment standards are proposed for these operations at this time. Instead, the Agency references 43 FR 27736-27773, "General Pretreatment Regulations for Existing and New Sources of Pollution," (Monday, June 26, 1978) for these operations. Should toxic pollutants be found in these wastewaters, as a result of the Agency's continuing investigation, the Agency will promulgate PSES and PSNS based upon zero discharge. This technology is described in Section IX.

B. Using Soluble Oil Solutions

Waste oil solutions from most plants are currently hauled off-site for disposal by contractors. None of these plants discharge spent oil solutions to a POTW. To insure that these solutions, which may contain large quantities of toxic organics and emulsified oils not treatable by municipal systems, do not pass through POTWs or interfere with their operation, a zero discharge standard is being proposed for these operations.

ALKALINE CLEANING SUBCATEGORY

SECTION I

PREFACE

The USEPA is proposing effluent limitations guidelines and standards for the steel industry. The proposed regulation contains effluent limitations guidelines for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS), under Sections 301, 304, 306, 307 and 501 of the Clean Water Act.

This part of the Development Document highlights the technical aspects of EPA's study of the Alkaline Cleaning Subcategory of the Iron and Steel Industry. Volume I of the Development Document discusses issues pertaining to the industry in general, while other volumes relate to the remaining subcategories of the industry.

ALKALINE CLEANING SUBCATEGORY

SECTION II

CONCLUSIONS

This report highlights the Agency's evaluation of the Alkaline Cleaning subcategory. Based upon additional data obtained through field sampling, analyses, and questionnaires the Agency has reached the following conclusions.

1. Although alkaline cleaning operations are conducted on both a batch and continuous basis, the Agency has not subdivided the alkaline cleaning subcategory on that basis since similar effluent flow rates and effluent quality can be achieved for both operations.

2. The model treatment system used as a basis for the BPT limitations promulgated in 1976 for alkaline cleaning operations remains applicable for all operations in this subcategory. The model treatment system consists of equalization and oil separation, polymer and acid addition followed by sedimentation in a flocculation-clarifier. Sludges are dewatered in a vacuum filtration system.

3. The Agency is not proposing limitations for dissolved chromium, nickel, and iron as were contained in the originally promulgated BPT regulation. Data gathered for this study demonstrate that these pollutants are found only in low concentrations in raw alkaline cleaning wastewaters. The discharge of pollutants in the alkaline cleaning subcategory at the proposed BPT level of treatment is characterized as follows.

	Effluent Loadings (Tons/Yr)	
	Raw Waste	Proposed BPT
Flow, MGD	2.9	2.9
TSS	1,521	76
Oil and Grease	61	30
Dissolved Iron	1.5	1.5
Toxic Metals	0.8	0.8
Toxic Organics	0.2	0.2

4. Based upon facilities in place as of January 1, 1978, the Agency estimates the following costs will be incurred by the industry to bring alkaline cleaning operations into compliance with the proposed BPT limitations.

	Costs (Millions of July 1, 1978 Dollars)			
	Investment Costs			Annual
	Total	Required	In-Place	Costs
BPT	$13.6	$7.1	$6.5	$4.2

5. Sampling and analyses of alkaline cleaning wastewaters revealed that low concentrations of toxic pollutants are found in the raw wastewaters. Aside from flow reduction, the Agency is not aware of any economically achievable method to further reduce the discharge of low levels of toxic pollutants. The Agency also lacks sufficient information to determine whether reduction of alkaline cleaning wastewaters is feasible. Hence, the Agency is not proposing BAT limitations for this subcategory.

6. The Agency evaluated the "cost/reasonableness" of controlling the discharge of conventional pollutants in this subcategory by a variety of treatment methods. However, the cost to control these pollutants is far in excess of the comparable POTW costs. Therefore, EPA is proposing BCT limitations for the alkaline cleaning subcategory that are the same as the proposed BPT limitations.

7. The Agency is not proposing specific pretreatment standards for the alkaline cleaning subcategory since the pollutants present in these wastewaters are compatible with POTW systems. The general pretreatment standards apply to the alkaline cleaning subcategory.

8. With respect to the "remand issues," the Agency has reached the following conclusions.

   a. The age of an alkaline cleaning line has no significant effect upon the ease or cost of retrofitting pollution control equipment. Therefore, neither relaxed limitations for "older" lines nor retrofit cost allowances are included for alkaline cleaning operations.

   b. The remand also required examination of the consumptive use of water that would result from compliance with the proposed effluent limitations. Since no cooling systems are included in any of the model treatment systems, little or no consumption of water due to wastewater treatment is expected. Hence, there is no impact on the consumptive use of water.

9. The Agency believes that cascade rinsing and direct recycle of treated alkaline cleaning rinsewaters may be feasible. However, the Agency has limited information or data about recycle as practiced in this subcategory. Hence, the Agency solicits comments and information on whether flow reduction of the BPT effluent by recycle or other means should be considered as BAT and BCT alternative treatment systems. The Agency estimates the cost to recycle ninety percent of the BPT effluent would be $5.5 million for this subcategory. The resultant effluent quality

would be as follows for a model plant in comparison to the proposed BPT effluent limitations.

	Proposed BPT		Proposed BCT	
	mg/l	kg/kkg	mg/l	kg/kkg
Flow, GPT	50		5	
TSS	25	0.0052	25	0.00052
Oil and Grease	10	0.0021	10	0.00021
Dissolved Iron	0.50	0.00010	0.50	0.000010
Toxic Metals	0.25	0.00005	0.25	0.000005
Toxic Organics	0.055	0.00001	0.055	0.000001

10. Table II-1 presents the treatment model flow and effluent quality data used to develop the proposed BPT effluent limitations for the alkaline cleaning subcategory, and Table II-2 presents these proposed limitations. Table II-3 presents the treatment model flow and effluent quality data used to develop the proposed BAT and BCT effluent limitations and the proposed NSPS, PSES, and PSNS for the alkaline cleaning subcategory; Table II-4 presents these proposed limitations and standards.

TABLE II-1

BPT TREATMENT MODEL FLOWS AND EFFLUENT QUALITY ALKALINE CLEANING SUBCATEGORY

Pollutant	Monthly Average Concentration (mg/l)(1)
Flow, gal/ton	50
TSS	25
pH, units	6.0 to 9.0

---

(1) The daily maximum concentration is three times the monthly average concentration presented above.

TABLE II-2

PROPOSED BPT EFFLUENT LIMITATIONS ALKALINE CLEANING SUBCATEGORY

Pollutant	Effluent Limitations (kg/kkg of Product)(1)
TSS	0.0052
pH, units	Within range of 6.0 to 9.0

---

(1) The daily maximum effluent limitation is three times the monthly average effluent limitation presented above.

TABLE II-3

TREATMENT MODEL FLOWS AND EFFLUENT QUALITY ALKALINE CLEANING SUBCATEGORY

Pollutant	Monthly Average Concentration (mg/1)(1)				
	BAT	BCT	NSPS	PSES	PSNS
Flow, gal/ton	(2)	50	50	(3)	(3)
TSS		25	15		
O&G		-	10*		
pH, units		6.0 to 9.0	6.0 to 9.0		

---

* : As shown, daily maximum concentration only.

(1): Daily maximum concentrations are the above monthly average concentrations multiplied by the following factors:

Pollutant	Factor
TSS for BCT	3.0
TSS for NSPS	2.67

(2): No limitations are currently proposed for BAT.

(3): No pretreatment standards are currently proposed. Only the general pretreatment regulation applies.

TABLE II-4

PROPOSED EFFLUENT LIMITATIONS AND STANDARDS
ALKALINE CLEANING SUBCATEGORY

Pollutant	Effluent Limitations (kg/kkg of Product)(1)				
	BAT	BCT	NSPS	PSES	PSNS
TSS	(2)	520	310		
O&G		-	210*	(3)	(3)
pH, units		6.0 to 9.0	6.0 to 9.0		

---

*: As shown, daily maximum standard only.

(1) The proposed limitations and standards have been multiplied by 10^5 to obtain the values presented in this table.
Daily maximum effluent limitations and standards are the above monthly average limitations and standards multiplied by the following factors:

Pollutant	Factor
TSS for BCT	3.0
TSS for NSPS	2.67

(2) No limitations are currently proposed for BAT.

(3) No pretreatment standards are currently proposed. Only the general pretreatment regulation applies.

ALKALINE CLEANING SUBCATEGORY

SECTION III

INTRODUCTION

General Discussion

Alkaline cleaning is that process in which steel products are cleaned prior to entering other finishing operations such as coating or pickling. Several solutions are used in the cleaning baths but since alkaline cleaning lines have the same purpose, most operations have similar characteristics.

Since the baths used in alkaline cleaning are not aggressive, large amounts of pollutants are not generated. The pollutants generated are generally found at relatively low concentrations. The most significant pollutants contributed by this process are suspended solids, oil and grease, and some metals. These pollutants originate in the alkaline cleaning bath and in the rinse step which usually follows the cleaning bath.

Almost all alkaline cleaning operations are included in larger steel finishing mills. For example, an alkaline cleaning bath and rinse step may precede a pickling operation which may in turn precede a coating operation. While this entire steel finishing operation may be operated in an integrated manner, finishing operations have been subcategorized such that appropriate effluent limitations could be established for each discrete operation. This allows for consideration of plant-specific process configurations during the preparation of NPDES permits.

As with many other finishing operations, there are two types of alkaline cleaning operations: batch and continuous. These are illustrated in Figures III-1 and III-2 which detail complete finishing operations (i.e., cleaning, pickling). The information developed and presented in this report applies only to the alkaline cleaning portion of the steel finishing operation.

Development of Limitations

Effluent limitations applicable to alkaline cleaning operations were last promulgated on March 29, 1976 and included five pollutants: total suspended solids, dissolved iron, dissolved chromium, dissolved nickel, and pH. For this study, the Agency conducted additional sampling and gathered detailed information from the steel industry to provide an expanded data base. The primary source of new information is the industry's response to the basic data collection portfolios (DCPs) that were sent to approximately 85% of the active alkaline cleaning operations in the United States. Information was provided for 175 alkaline cleaning operations through the DCPs. The data for batch and continuous mills have been tabulated and summarized in Tables III-1 and III-2, respectively.

Detailed data collection portfolios (D-DCPs) were sent to selected mills to gather information on long-term effluent quality, cost information on the wastewater treatment systems installed, and the cleaning operation. Detailed data for twenty alkaline cleaning operations at three plant sites were solicited through these D-DCPs. The responses provided data to verify cost estimates, and to establish retrofit costs.

The previous limitations for the alkaline cleaning subcategory were based solely upon data obtained through field sampling at one plant. During this study, two additional lines were sampled and the one line originally sampled was revisited. This sampling increased the existing data base for the limited pollutants and provided data for toxic pollutants. A complete list of all alkaline cleaning operations sampled, with a basic description of each, is provided in Table III-3. As shown in Table III-3, Mill 0432K was sampled twice and designated as Mill I on the first visit and Mill 157 on the second visit. The updated data base for this subcategory is presented in Tables III-4 and III-5.

Description of Alkaline Cleaning Operations

Alkaline cleaners are used where vegetable, mineral and animal fats and oils must be removed from the steel surface prior to further processing. Immersion in solutions of various compositions, concentrations, and temperatures is often satisfactory. Electrolytic cleaning may be used for large scale production or where a cleaner product is required. The alkaline cleaning bath is a solution or dispersion of various chemicals in water. These chemicals can include carbonates, alkaline silicates and phosphates. Wetting agents are often added to the cleaning bath to facilitate cleaning.

TABLE III-1

SUMMARY TABLES
ALKALINE CLEANING - BATCH TYPE MILLS

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
060N-01	Pipe	SS	1970	5	42	42	CNT(UNK),1;ML; MW; SS;O(#1); Rinses + Cleaner	1970	No
060N-02	Pipe	SS	1970	5	42	42	CNT(UNK), 1; ML; MW; SS; O(#1); Rinses + Cleaner	1970	No
068-01	Bar, Strip	CS	1934	39	1829	1829	Untreated to POTW; Rinses + Cleaner	NA	Yes
068-03	Rod	CS	1937	1	236	236	Untreated to POTW; Rinses + Cleaner; REU, 85	NA	Yes
112C	Bar, Wire, Rod	NA	1972	NA	NA	NA	Untreated Rinses + Cleaner	NA	No
112F	Wire	CS	1948	2	UNK	UNK	Rinse + Cleaner are hauled	NA	No
112I-02	Fasteners	CS	1951	38	UNK	UNK	CNT 3,5 MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-03	Fasteners	CS	1922	65	UNK	UNK	CNT 3(UNK) MW; ML, SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-04	Plate Washers, Slugs	CS	1970	146	67	67	CNT 3, 10 MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-05	Fasteners	CS	1970	4	UNK	UNK	CNT 3, 1; MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-06	Fasteners	CS	1970	44	UNK	UNK	CNT 3(UNK) MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-07	Fasteners	CS	1956	12	UNK	UNK	CNT 3(UNK) MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-08	Fasteners	CS	1962	16	UNK	UNK	CNT 3(UNK) MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-09	Fasteners	CS	1950	17	UNK	UNK	CNT 3, <1; MW; ML; SL(UNK); SS; T; FDS(UNK); Rinses + Cleaner	Pre 1950	No
112I-15	Forgings, Set Screws	CS	1968	12	UNK	UNK	CNT 3, 1; MW; ML; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
240B-01	Tubes	CS	1965	240	24	24	RET, 75, CNT 3, 9.3 MW; ML; AO; SS; T; VF; SL(UNK); Rinses + Cleaners	1968	No
240B-02	Tubes	CS	1974	102	28	28	RET, 100 CNT 3, 4.6 MW; ML; AO; SS; T; VF; SL(UNK); Rinses + Cleaners	1968	No
240B-03	Tubes	CS	1938	54	53	53	RET,100,CNT 3, 4.6 MW; NA; AO; SS; T; VF; SL(UNK)	1968	No
240B-04	Tubes	CS	1954	3	UNK	UNK	CNT 3, 0.3 MW; ML; AO; SS: T; VF; SL(UNK); Rinses + Cleaners	1968	No
240C	Tubes	CS	1973	102	8	7	Rinses + Cleaner Hauled	NA	No
248C	Bar, Rod, Wire	SS	1973	13	UNK	UNK	CNT; ML; A; CL; T; VF; FLO(1), FLP	1975	No
256N-01	Bar	**	1965	**	**	**	NA, Then to POTW; Treated 95%, Untreated 5%	1973	Yes
256N-02	Shapes	**	1976	**	**	**	NA, Then to POTW; Treated 95%, Untreated 5%	1973	Yes

TABLE III-1
SUMMARY TABLES
ALKALINE CLEANING - BATCH TYPE MILLS
PAGE 2

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
384A	Sheet, Strip	CS	1968	858	168	168	CNT(UNK) 0.45 SS; CL, FLL; FLA; FLP, FLO(6) Spent Cleaner hauled	1970	No
460D	Wire	CS	1959	55	266	266	CNT, T, VF, NL, FLP, CL	1970	No
460G	Wire	CS	1969	19	270	270	CNT(UNK), NO(2) SL	1968	No
460H	Wire	CS	1957	42	170	170	Untreated to POTW, Cleaner is hauled	NA	Yes
476A	Rod, Wire	CS	1960	UNK	UNK	UNK	CNT(UNK) (UNK) A, SCR; SS; NL; FLP; CL; SL(UNK); Cleaner dumped 4/6 Mo.	1977	No
492A-01	Pipe	CS	1962	186	UNK(3)	UNK(3)	No Rinses(rinse with pickling line) Cleaner to acid pit	NA	No
548	Tube	CS	1927	23	961	961	CNT, FLL, NL, NA, SL	1969	No
548A	Pipe, Tube	CS	1957	15	UNK	UNK	CNT 3(UNK) NC; NW; SL(UNK); Cleaner	1967	No
548B-01	Tube	CS	1947	54	216	216	No Treatment	NA	Yes
548B-02	Tube	SS	1947	2	1290	1290	No Treatment	NA	Yes
580A-03	Wire	CS	1962	4	1951	1951	CNT 3, 2.6 F(UNK) (UNK) P; NL; NW; Cleaner - CR then with rinse, RET, 100	1967	No
580G-01	Wire	CS	1971	2	600	600	No Treatment	UNK	Yes
580G-02	Wire	CS	1971	5	2000	2000	No Treatment	UNK	Yes
580G-04	Wire	CS	1971	2	5000	5000	No Treatment	UNK	Yes
580G-10	Wire	CS	1971	1	8000	8000	None	UNK	Yes
580G-11	Wire	CS	1971	2	400	400	None	UNK	Yes
636-01	Tube	SS	UNK	NA	NA	NA	NW, CNT(0.5) Cleaner	1974	Yes
636-02	Tube	CS	1943	NA	NA	NA	NW, CNT(0.5) Cleaner	1974	Yes
636-03	Tube	SS	UNK	NA	NA	NA	NW, CNT(0.5) Cleaner	1974	Yes
684Y-01	Sheet	**	**	**	**	**	NL, FLP, CL, F(UNK), E, CNT; Rinse only	1977	No
728	Pipe	CS	1952	75	5	5	Cleaners hauled, no rinses	1971	No
776C	Pipe, Tube	SS	1957	**	**	**	CNT(40) NA, Rinses, Cleaners Hauled	1957	Yes
776D	Pipe, Tube	CS	1948	**	**	**	CNT(40) NA, Rinses, Cleaners Hauled	1973	Yes
776G-01	Wire	SS	1950	NA	NA	NA	FDS(UNK), FLP, NC CNT(1), Rinses + Cleaner	NA	No
856N-01	Couplings	CS	1935	3	NA	NA	N; Rinse + Cleaner	NA	No
856Q-01	Couplings	CS	1947	35	UNK	UNK	SL(UNK), SS, CNT(1);	1963	No
916A-01	Tube	CS	1931		UNK	UNK	N; Rinses + Cleaner	NA	No

NOTE: For a definition of the abbreviations used, refer to Table VII-1.
** : Confidential Information
[] : Data listed in brackets was received during a sampling visit.

(1) Ferric chloride
(2) Ammonia
(3) Cleaning tank wastes dumped; volume unknown.

TABLE III-2

SUMMARY TABLES

ALKALINE CLEANING - CONTINUOUS TYPE MILLS

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
060D-01	Strip	SS	1967	213	4056	UNK	CNT(UNK) (UNK) PSP; FLL; FLP; CL; SL(UNK) Spent Cleaner + Rinses	1958	No
060D-02	Strip	SS	1966	132	6545	6545	Not Treated; Rinses + Cleaner	NA	No
068-02	Chain Link Fence	CS	1934	104	693	693	Untreated to POTW; Rinses + Cleaner	NA	Yes
088C-01	Tube	CS	1930	NA	UNK(5)	UNK(5)	Untreated to POTW; Rinses + Cleaner	NA	Yes
088C-02	Tube	CS	1930	NA	UNK(5)	UNK(5)	Untreated to POTW; Rinses + Cleaner	NA	Yes
088C-03	Tube	CS	1930	NA	UNK(5)	UNK(5)	Untreated to POTW Rinses + Cleaner	NA	Yes
088C-04	Tube	CS	1930	NA	UNK(5)	UNK(5)	Untreated to POTW; Rinses + Cleaner	NA	Yes
088C-05	Tube	CS	1930	NA	UNK(5)	UNK(5)	Untreated to POTW; Rinses + Cleaner	NA	Yes
112A-01	Strip	CS	1936	NA	NA	NA	CNT(UNK) 1.8 to 5.3; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; To 0(3) Cleaner + Rinses	1977	No
112A-02	Strip	CS	1936	NA	NA	NA	CNT(UNK) 1.8 to 5.3; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; To 0(3) Cleaner + Rinses	1977	No
112A-03	Strip	CS	1936	NA	NA	NA	CNT(UNK) 1.8 to 5.3; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; To 0(3) Cleaner + Rinses	1977	No
112A-04	Strip	CS	1936	NA	NA	NA	CNT(UNK) 1.8 to 5.3; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; To 0(3) Cleaner + Rinses	1977	No
112A-05	Strip	CS	1956	NA	NA	NA	CNT(UNK) 1.8 SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to 0(3) Rinses + Cleaner	1977	No
112A-06	Strip	CS	1957	NA	NA	NA	CNT(UNK) 1.8 SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to Rinses + Cleaner	1977	No
112A-07	Strip	CS	1957	NA	NA	NA	CNT(UNK) 1.8 SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to Rinses + Cleaner	1977	No
112A-08	Strip	CS	1962	1152	508	508	RET, 98.5, CNT(UNK) 0.6 to 2.0; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to 0(3) Rinses + Cleaner; FNS	1977	No
112A-09	Strip	CS	1963	1032	421	421	CNT(UNK) 0.5 to 1.3; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to 0(3) Rinses + Cleaner; FNS	1977	No
112A-10	Strip	CS	1966	960	906	906	CNT(UNK) 1.0 to 3.0; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to 0(3) Rinses + Cleaner; FNS	1977	No
112A-11	Strip	CS	1956	492	12	12	CNT(UNK) 0.005 to 0.02; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to 0(3) Rinses + Cleaner	1977	No
112A-12	Strip	CS	1956	441	13	13	CNT(UNK) 0.005 to 0.02; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; to 0(3) Rinses + Cleaner	1977	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 2

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
112A-13	Strip	CS	1970	864	221	221	RET, 100, CNT(UNK) 0.2 to 0.7; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; T; O(3) Rinses + Cleaner; FHS	1977	No
112A-14	Strip	CS	1957	369	15	15	CNT(UNK) 0.005 to 0.02; SS, SCR; NL; A; FLA; FLP; SL(UNK); CT; T; O(3) Rinses + Cleaner	1977	No
112A-15	Strip	CS	1958	480	12	12	CNT(UNK) 0.005 to 0.02; SS; SCR; NL; A; FLA; FLP; SL(UNK); CT; T; O(3) Rinses + Cleaner	1977	No
112D-01	Sheet	CS	1965	1614	UNK	UNK	CNT(3), <1SS; CL; FLP, NW; NL; CR; SL(UNK), Rinses + Cleaner; FHS; RT-50	1964	No
112D-02	Tin + Chrome Plate	CS	1966	1156	UNK	UNK	CNT(3), <1; SS; CL; FLP; NW; NL; CR; SL(UNK); Rinses + Cleaner; FHS; RT-90	1964	No
112I-01	Fasteners	CS	1927	29	UNK	UNK	CNT 3, 10 NW; NL; SL(UNK); SS; T; FDS(UNK); E; Rinses + Cleaner	Pre 1950	No
112I-10	Fastener	CS	1955	10	UNK	UNK	CNT 3, <1; NW; NL; SL(UNK); SS; T; FDS(UNK); Rinses + Cleaner	Pre 1950	No
112I-11	Fastener	CS	1952	10	UNK	UNK	CNT 3, <1; NW; NL; SL(UNK); SS; T; FDS(UNK); Rinses + Cleaner	Pre 1950	No
112I-12	Fastener	CS	1958	18	UNK	UNK	CNT 3, <1; NW; NL; SL(UNK); SS; T; FDS(UNK); Rinses + Cleaner	Pre 1950	No
112I-13	Fastener	CS	1971	10	UNK	UNK	CNT 3, <1; NW; NL; SL(UNK); SS; T; FDS(UNK); Rinses + Cleaner	Pre 1950	No
112I-14	Fastener	CS	1971	0	UNK	UNK	CNT 3, <1; NW; NL; SL(UNK); SS; T; FDS(UNK); Rinses + Cleaner	Pre 1950	No
176-01	Strip	NA	1962	31	815	815	CNT 3, 1; FLP; NL; NW; NA; CL; T; CT; Rinses + Cleaner	1963	No
176-02	Strip	NA	1963	10	710	710	CNT 3, 0.5; FLP; NC; NW; NA; CL; T; CT; Rinses + cleaner	1963	No
176-03	Strip	NA	1963	4	1108	1108	CNT 3, 0.3; FLP; NC; NW; NA; CL; T; CT; Rinses + Cleaner	1963	No
176-04	Strip	NA	1964	12	828	828	CNT 3, 0.7; FLP; NC; NW; NA; CL; T; CT; Rinses + Cleaner	1963	No
176-05	Strip	NA	1966	5	558	558	CNT 3, 0.2; FLP; NC; NW; NA; CL; T; CT; Rinse + Cleaner	1963	No
176-06	Strip	NA	1968	11	1763	1763	CNT 3, 1.3; FLP; NC; NW; NA; CL; T; CT; Rinse + cleaner	1963	No
176-07	Strip	NA	1976	NA	NA	NA	CNT 3, 0.5; FLP; NC; NW; NA; CL; T; CT; Rinse + Cleaner	1963	No
2560-01	Strip	**	1965	68	59	59	Untreated	NA	No
2560-02	Strip	**	1966	21	372	372	CNT(UNK); 1; NL; FLP; CL; VF; Rinses + Cleaner	1978	No
432A-01	Sheet	CS	1960	777	UNK	UNK	CNT 3(UNK) F; E; SS; NL; NC; FLP; CL; T; VF; Rinse + Cleaners	1970	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 3

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Di.. To POTW
432A-02	Sheet	CS	1940	645	UNK	UNK	CNT 3(UNK) F; E; SS; NL; NC; FLP; CL; T; VF; Rinse + Cleaners	1970	No
432A-03	Sheet	CS	1951	768	UNK	UNK	CNT 3(UNK) F; E; SS; NL; NC; FLP; CL; T; VF; Rinse + Cleaners	1970	No
432K	Coil	SS	1962	95	254	254	CNT(UNK) 0.8, NL; SL(UNK) Rinse + Cleaner	UNK	No
448A-01	Sheet	CS	1970	987	UNK	UNK	CNT(UNK) (UNK) CL to POTW Rinse + Cleaners; FMS	1969	Yes
448-02	Sheet	CS	1959	650	UNK	UNK	CNT(UNK) (UNK) CL to POTW Rinse + Cleaners	1969	Yes
448A-03	Sheet	CS	1954	928	UNK	UNK	CNT(UNK) (UNK) CL to POTW Rinse + Cleaners	1969	Yes
528	Sheet	SS	1961	93	387	387	CNT(UNK) (UNK) NA; SS then to POTW Rinses + Cleaner; FMS	UNK	Yes
580-01	Wire	CS	1960	1	4000	4000	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580-02	Wire	CS	1965	2	1875	1875	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580-03	Wire	CS	1965	5	1333	1333	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580-04	Wire	CS	NA	3	1500	1500	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580-05	Wire	CS	1965	15	300	300	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580-06	Wire	CS	1965	30	150	150	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580-07	Wire	CS	1965	5	1333	1333	Rinse Untreated to POTW Cleaner N(UNK); SL(UNK)	NA	Yes
580A-01	Wire Cloth	CS	1962	2	21264	21264	CNT 3, 8 F(UNK) (UNK) P; NL; MW; Rinses + Cleaner	1966	No
580A-01	Wire Cloth	CS	1962	2	23833	23833	CNT 3, 11 F(UNK) (UNK) P; NL; MW; Rinses + Cleaner, RET, 70	1967	No
580B-01	Wire	CS	1965	15	300	300	No Treatment - Contract Removal	NA	Yes
580B-02	Wire	CS	1965	30	150	150	No Treatment - Contract Removal	NA	Yes
580D-01	Wire	CS	1965	15	300	300	Rinse + Cleaner FLP, MW, CL, SL(UNK), CNT(UNK) 3	1965	No
580D-02	Wire	CS	1965	30	150	150	Rinse + Cleaner FLP, MW, CL, SL(UNK); CNT(UNK) (UNK)	1965	No
580E-01	Wire	CS	1950	30	150	150	Rinse + Cleaner MW, CNT(UNK) 20	1970	Yes
580G-03	Wire	CS	1971	2	3750	3750	No Treatment	UNK	Yes
580G-05	Wire	CS	1971	2	3750	3750	No Treatment	NA	Yes
580G-06	Wire	CS	1971	2	6000	6000	No Treatment	NA	Yes
580G-07	Wire	CS	1960	2	6000	6000	None	NA	Yes
580G-08	Wire	CS	1960	2	6000	6000	None	NA	Yes
580G-09	Wire	CS	1960	2	6000	6000	None	NA	Yes

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
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Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
584E-01	Sheet	CS	1965	1005	488	488	DW,IX,BO(UNK), CR, EB, F(UNK) (UNK) P, CO, FLL, FLP, GF, NL, NW, CL, SL(UNK),SS,CNT; Rinse + Cleaner	1960	No
584F-01	Sheet	CS	1948	714	UNK$^{(2)}$	UNK$^{(2)}$	N	1960	No
584F-02	Strip	CS	1957	621	2	2	N	1970	No
584F-03	Strip	CS	1958	237	6	6	N	1970	No
584F-04	Strip	Cs	1966	561	3	3	N	1970	No
584F-05	Strip	CS	1940	1077	NA	NA	UNK	UNK	UNK
584F-06	Sheet	CS	1950	1077	NA	NA	None	NA	UNK
584F-07	Sheet	CS	1960	477	503	503	None	NA	UNK
684*-01	Sheet	*	**	**	**	**	None	NA	No
684*-02	Fabricated and Formed Steel Items	*	**	**	**	**	None	NA	No
684C	Sheet	CS	1964	0$^{(2)}$	UNK	UNK	NW	1937	No
684X-01	Sheet	*	**	**	**	**	None	NA	No
684X-02	Sheet	*	**	**	**	**	None	NA	No
684X-03	Sheet	*	**	**	**	**	None	NA	No
684Z-01	Sheet	*	**	**	**	**	None	NA	Yes
684Z-02	Tube	*	**	**	**	**	None	NA	Yes
760-01	Coil	CS	1920	65	88	88	None	NA	Yes
856D-01	Sheet	CS	1938	786	NA	NA	FLP, EB, SS, FLO(8), CNT(3); Rinses + Cleaner	1960	No
856D-02	Sheet	CS	1941	1245	NA	NA	FLP, EB, SS, FLO(8), CNT(4); Rinses + Cleaner	1960	No
856D-03	Sheet	CS	1962	870	NA	NA	FLP, EB, SS, FLO(8), CNT(4); Rinses + Cleaner	1960	No
856E-01	Strip	SS	1969	282	894	894	None, FHS	NA	No
856E-02	Strip	SS	1957	NA	NA	NA	None	NA	No
856E-03	Strip	SS	1956	NA	NA	NA	None	NA	No
856E-04	Strip	SS	1956	296	487	487	None	NA	No
856F-01	Sheet	CS	1952	882	204	204	CR, NW, NL, FLL, SS, CL, CNT(1); Rinse + Cleaner	1952	No
856Q-02	Couplings	CS	1960	38	UNK	UNK	SL(UNK), SS, CNT(1); Rinse + Cleaner	1963	No
860B-01	Strip, Coil	CS	1950	564	766	766	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-02	Strip	CS	1951	681	1692	1692	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-03	Strip	CS	1960	1029	1120	1120	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-04	Sheet	CS	1943	357	1210	1210	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-05	Strip, Coil	CS	1937	462	649	649	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-06	Strip	CS	1957	762	567	567	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-07	Sheet, Strip	CS	1962	963	935	935	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 5

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
860B-08	Strip	CS	1967	900	480	480	EB, FLL, FLP FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-09	Sheet, Strip	CS	1956		Line has been shutdown				
860B-10	Strip, Coil	CS	1967	1247	231	231	EB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
860B-11	Sheet, Strip	CS	1950	327	1835	1835	DB, FLL, FLP, FLO(3), NL, NW, CL, SS, O(4), CNT	UNK	No
864B-01	Sheet, Coil	CS	1948	810	267	267	SS, NL, FLL, FLP, CL, MA, FNS, CNT(1); Rinses + Cleaner, RET, 100	1972	No
864B02	Sheet, Coil	CS	1953	363	595	595	SS, NL, FLL, FLP, CL, MA, FNS, CNT; Rinses + Cleaner	1972	No
064B-03	Sheet	CS	1958	561	385	385	SS, NL, FLL, FLP, CL, MA, FNS, CNT; Rinses + Cleaner	1972	No
864B-04	Sheet	CS	1960	882	245	245	RET, 100, SS, NL, FLL, FLP, CL, MA, FNS, CNT; Rinses + Cleaner	1972	No
064B-05	Sheet	CS	1963	864	250	250	SS, NL, FLL, FLP, CL, MA, FNS, CNT; Rinses + Cleaner	1972	No
064B-06	Sheet, Coil	CS	1965	759	285	285	SS, NL, FLL, FLP, CL, MA, FNS, CNT; Rinses + Cleaner	1972	No
868A-01	Sheet	CS	1938	633	946	946	F(UNK) (UNK) P, FLP, NL, CL, SL(UNK), FLO(6), CNT(7); Rinses + Cleaner	1971	No
868A-02	Sheet	CS	1938	855	701	701	F(UNK) (UNK) P, FLP, NL, CL SL(UNK), FLO(6), FNS, CNT; Rinses + Cleaner	1971	No
068A-03	Strip	CS	1944	450	96	96	F(UNK) (UNK) P, FLP, NL, CL, SL(UNK), FLO(6), FNS, CNT; Rinses + Cleaner	1971	No
868A-04	Strip	CS	1955	543	133	133	F(UNK) (UNK) P, FLP, NL, CL, SL(UNK), SS, FLO(6), CNT, FNS; Rinses + Cleaner	1971	No
868A-05	Sheet	CS	1960	825	243	243	F(UNK) (UNK) P, FLP, NL, CL, SL(UNK), SS, FLO(6), CNT, FNS; Rinses + Cleaner	1971	No
868A-06	Strip	CS	1943	444	162	162	F(UNK) (UNK) P, FLP, NL, CL SL(UNK), SS, FLO(6), FNS, CNT, Rinses + Cleaner	1971	No
868A-07	Strip	CS	1965	312	762	762	F(UNK) (UNK) P, FLP, NL, CL, SL(UNK), SS, FLO(6), CNT; Rinses + Cleaner	1971	No
920G-01	Sheet	CS	1959	676	776	776	CR, NL, FLL, FLP, CL, CNT; Rinses + Cleaner	Future 1977	No
920G-02	Sheet	CS	1937	391	538	538	CR, NL, FLL, FLP, CL, CNT; Rinses + Cleaner	Future 1977	No

TABLE III-2
SUMMARY TABLES
ALKALINE CLEANING - CONTINUOUS TYPE MILLS
PAGE 6

Plant Code	Products	Steel Type	Mill Age	Mill Size (TPD)	Process Flow (GPT)	Discharge Flow (GPT)	Control and Treatment Technologies	Treatment Age	Mill Disc To POTW
920G-03	Sheet	CS	1957	1058	354	354	CR, NL, FLL, FLP, CL, CNT; Rinses + Cleaner	Future 1977	No
9200-01	Sheet	CS	UNK	240	1	1	NC, MA, NW, SS, CNT(1); Rinses + Cleaner	1967	No
920L-01	Coil	CS	1961	243	509	509	CR, NL, FLP, CL, CNT; Rinses + Cleaner	1973	No
948F-01	Pipe, Tube	CS	1959	82	176	176	Cleaners hauled; No Treatment for the Rinses	NA	No

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NOTE: For a definition of abbreviations used, see Table VII-1.

** : Confidential information
[] : Data in brackets was received during a sampling visit.

(1) - Cleaning tank waste dumped once every 8 weeks, volume unknown.
(2) - Cleaner has no operated since 1974.
(3) - Waste Pickle Liquor.
(4) - Gravity Oil Separation
(5) - About 1/5 a tank per week

TABLE III-3

DESCRIPTION OF THE ALKALINE CLEANING MILLS SAMPLED FOR THIS STUDY

Sampling[1] Code	Plant[2] Code	Type of Steel	Type of Operation	Principle Product Processed
I	432K	Specialty	Continuous	Strip
152	0176-01	Unknown	Continuous	Strip
156	1121-04	Carbon	Batch	Plate Washers
157	432K	Specialty	Continuous	Strip

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(1) The sampling code is an alphabetic or numeric code assigned at the time of sampling.

(2) The plant code is a reference code designated for each company and plant For example, 0176-01 represents the first alkaline cleaning operation at plant 0176.

TABLE III-4

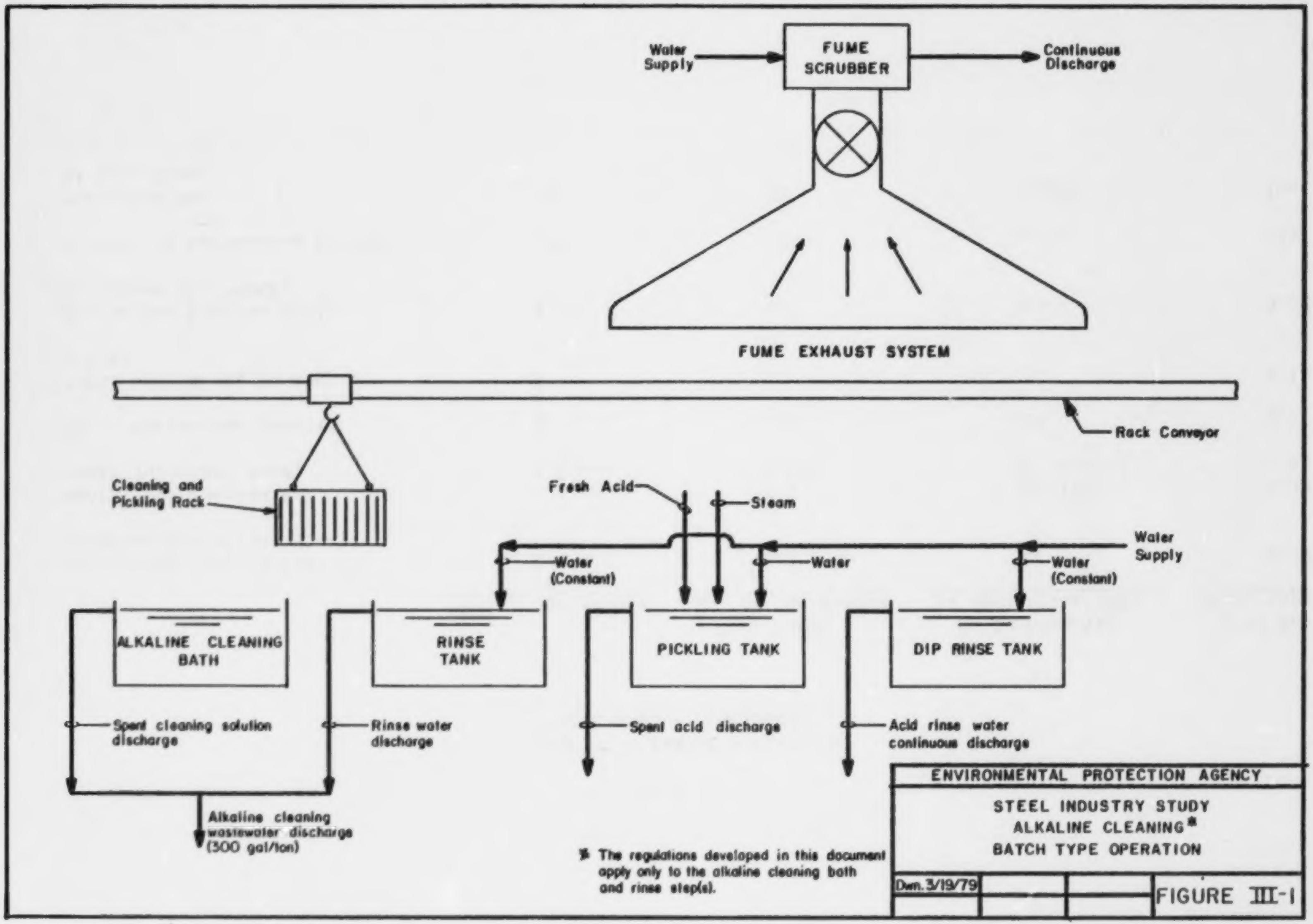
ALKALINE CLEANING SUBCATEGORY
DATA BASE - BATCH

	No. of Operations	% of Total No. of Operations	Daily Capacity of Operations (TPD)	% of Total Daily Capacity
Operations Sampled For Original Guidelines Study	0	0	0	0
Operations Sampled For Toxic Pollutant Survey	1	1.7	146	4.7
Total Operations Sampled	1	1.7	146	4.7
Total Operations To Receive D-DCPs	12	20	607	19.8
Operations Sampled And/Or Solicited Via D-DCPs	13	21.7	753	24.6
Operations Responding To DCPs	51	~85	2601	~85
Estimated No. Of Operations	60	100	3060	100

TABLE III-5

ALKALINE CLEANING SUBCATEGORY
DATA BASE - CONTINUOUS

	No. of Operations	% of Total No. of Operations	Daily Capacity of Operations(TPD)	% of Total Daily Capacity
Operations Sampled For Original Guidelines Study	1	0.7	95	0.19
Operations Sampled For Toxic Pollutant Study	2 incl. 1 above	1.4 0.68	126 incl. 95 above	0.25 0.19
Total Operations Sampled	2	1.4	126	0.25
Total Operations To Receive D-DCPs	7	0.7	170	0.34
Operations Sampled And/Or Solicited Via D-DCPs	9	6.2	296	0.59
Operations Responding To DCPs	124	~85	42,914	~85
Estimated No. Of Operations	146	100	50,487	100

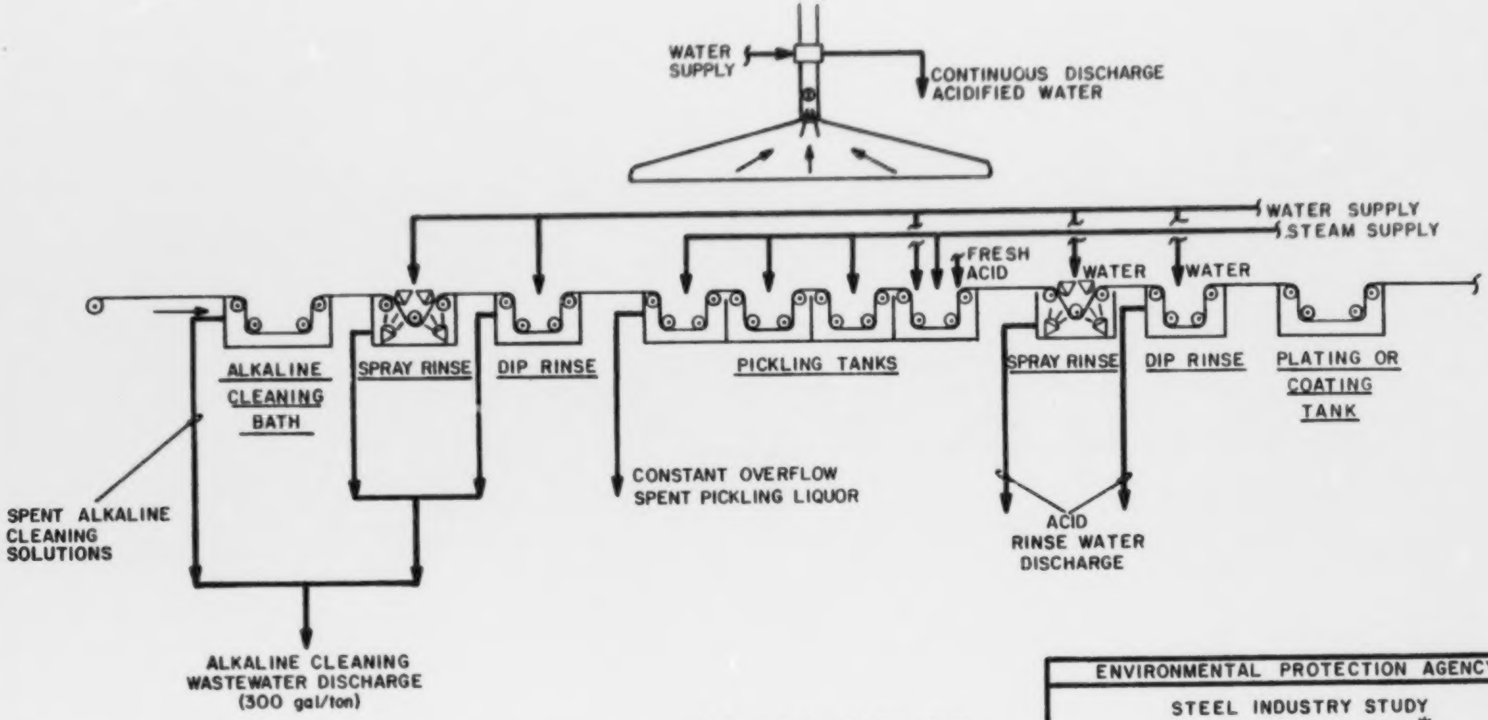


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING*
BATCH TYPE OPERATION

FIGURE III-1

* The regulations developed in this document apply only to the alkaline cleaning bath and rinse step(s).


WATER SUPPLY
CONTINUOUS DISCHARGE ACIDIFIED WATER
WATER SUPPLY
STEAM SUPPLY
FRESH ACID
WATER
WATER
ALKALINE CLEANING BATH
SPRAY RINSE
DIP RINSE
PICKLING TANKS
SPRAY RINSE
DIP RINSE
PLATING OR COATING TANK
SPENT ALKALINE CLEANING SOLUTIONS
CONSTANT OVERFLOW SPENT PICKLING LIQUOR
ACID RINSE WATER DISCHARGE
ALKALINE CLEANING WASTEWATER DISCHARGE (300 gal/ton)

* The regulations developed in this document apply only to the alkaline cleaning bath and rinse step(s).

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING *
CONTINUOUS TYPE OPERATION

Dwn. 3/20/79

FIGURE III-2

ALKALINE CLEANING SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

None of the factors examined by the Agency were found to affect the subdivision of the alkaline cleaning subcategory. Both types of operations (batch and continuous) demonstrated similar discharge flows and their discharges contain the same pollutants at similar levels.

The Agency also analyzed other elements to determine if further subdivision was appropriate, but none were found to have a significant effect. The Agency analyzed the impact of line age, type of product, raw materials, wastewater characteristics, treatability of wastewater pollutants and the geographic location of the plants. However, none of these factors were found to warrant further subdivision of the alkaline cleaning subcategory. Each of these factors is reviewed in greater detail below.

Manufacturing Process and Equipment

The Agency examined differences in the alkaline cleaning operations which might possibly affect subdivision. For example, there are two different ways in which the alkaline cleaning process is carried out. The cleaning can be done in either batch fashion where the product is moved manually in and out of cleaning and rinse tanks, or it can be done in a continuous fashion on sheet, strip or wire products. Alkaline cleaning operations can also be integrated into different types of larger production lines. Industry responses to the DCPs show that alkaline cleaning lines are used in conjunction with coating, annealing, galvanizing, plating and pickling lines. The Agency considered whether these different types of operations may affect the flow (applied or discharge) or wastewater characteristics and thus warrant further subdivision. However, the Agency found that these variations have no significant affect on either the effluent flow or the pollutants contained in the process wastewaters. Both batch and continuous operations can achieve similar flow rates and both discharge similar amounts of pollutants. In addition, no significant differences were found among alkaline cleaning operations that are part of larger complexes (Table IV-1). For these reasons, the Agency concluded that no further subdivision of the alkaline cleaning subcategory, based upon manufacturing process differences, is appropriate.

Final Products

The products processed in alkaline cleaning operations vary from sheet and strip to chain link fence. Based upon its analysis, the Agency concluded that the product being cleaned does not significantly affect the quality or quantity of the wastewaters generated. Thus, further subdivision based upon this factor is not appropriate.

Three mills were sampled for this study. While the Agency found the wastewater quality to vary between these mills, the Agency believes that these variations were not the result of the different types of products being processed. Data for mills in most other subcategories have shown that the type of final product processed does not have a significant effect on wastewater quality. Accordingly, the Agency expects a similar relationship in the alkaline cleaning subcategory as similar types and quantities of pollutants should originate in the cleaning tank and rinsing steps regardless of the type of product being processed.

The Agency also analyzed the potential for variations in wastewater flow depending on the final product being processed. The Agency originally thought that some of the processed product shapes (such as sheet and strip) might be easier to rinse than other products (such as tubes and wire). However, when the discharge flow data were analyzed no significant flow variations were found. Many mills producing different products achieve the proposed flow values. These data are also summarized in Table IV-1. For continuous mills, strip, sheet, and wire are the primary products processed. Low discharge flow rates are demonstrated for each. The Agency found that batch mills are able to achieve the model BPT flow of 50 gal/ton for four different product types.

At first, wire products appeared to have much higher applied and discharge flow rates than any other product type. The Agency found that the smaller wire lines have flow rates that were often in the range of thousands of gallons per ton. Because the Agency found these large variations for this one product type, it examined the data for these lines in great detail. It found that these lines have, on the average, similar applied flow rates to the process on a gallon per minute basis as all the other lines, but due to the extremely low tonnage processed (less than 1 ton/turn) the flow on a gallon per ton basis is extremely high. The cleaning process in these lines is only carried out for a fraction of a turn and, as a result, pollutants from the process are generated during a small portion of the eight hour turn. Flow calculations are based upon constant production over the eight hour period. Thus, the result of the calculations are high. These flow values could not be adjusted due to the unavailability of the length of time the alkaline cleaning operation is in use.

The Agency believes that changes in the current practice at the smaller wire mills could be implemented, which would enable these lines to achieve flow rates comparable with those from other lines. The cleaning baths and rinse tanks should be equipped with product activated flow or spray rinse valves so that flows occur only when the tanks are being used. Because the lines affected are extremely small, this practice should not cause any problems to the alkaline cleaning process and should not cause any disruptions in other parts of the finishing line.

Raw Materials

Carbon, stainless, and other types of steel are processed in alkaline cleaning operations. For purposes of this discussion, any line processing more than 50% carbon steel is considered to be a "carbon" steel line. The Agency found that the type of steel being processed does not significantly affect the quality or quantity of wastewater which is generated. For this reason, the Agency concluded that further subdivision based upon the type of raw material used (i.e., the type of steel processed) is not appropriate.

During its study, the Agency sampled one specialty line, one carbon steel line, and one operation which was not clearly designated. No significant differences were noted in the wastewater characteristics of these lines. All types of lines use similar cleaning solutions and operating practices and achieve similar flow rates regardless of the type of steel used. Based upon the limited data obtained, the Agency does not believe that there will be any significant variations in wastewater quality between carbon and specialty lines.

The Agency also analyzed wastewater flow variations which result from processing carbon and specialty steels. The Agency found that there are no significant differences between flow rates for carbon and specialty lines. There is a difference between carbon and specialty average flow rates for batch operations; however, this difference is attributable to the extremely small data base for the specialty mills (3 mills) and not to any particular variation in the operation of the mills.

Carbon and specialty alkaline cleaning lines do vary in size. It was found that the continuous operations were, on the average, ten times as large as the batch operations. This difference does not affect further subdivision since similar effluent levels can be achieved at any operation regardless of size. Separate cost estimates were made for batch and continuous operations to develop more representative costs to the industry.

Wastewater Characteristics

Wastewater from alkaline cleaning operations originates from two sources: the cleaning solutions and the rinse step or steps that follow the cleaning operation. The characteristics of the wastewaters leaving the process depend primarily upon three elements; (1) the solutions used in the cleaning baths; (2) the degree of carry-over of the pollutants from the cleaning tanks to the rinse step; and (3) the frequency of dumping the cleaning solution tanks.

Based upon the analysis of data for this subcategory, the Agency believes that there are no significant variations in the wastewater characteristics from alkaline cleaning operations. Similar pollutants originate in all alkaline cleaning operations and the levels at which they are discharged are not highly variable.

Wastewater Treatability

The Agency analyzed the treatability of wastewaters from the different types of alkaline cleaning operations. Based upon the data developed during the plant visits, and the data supplied in the DCPs,the Agency found that there are no significant differences in wastewater treatability between the different types of cleaning operations. As noted above, pollutants found in various alkaline cleaning wastewaters are similar and are subject to similar treatment. For this reason, the Agency has concluded that further subdivision of this subcategory based upon wastewater treatability is not appropriate.

Size and Age

Consideration was also given to the impact of size and age on the subdivision of the alkaline cleaning subcategory. The analysis does not show any need for subdivision.

Size was considered a possible factor for subdivision, but from the analysis of the compiled data, the Agency found that further subdivision based upon size is not appropriate. While alkaline cleaning operations vary greatly in physical size, layout and product size, the Agency found that these factors do not significantly affect process water usage, discharge flow rates, or effluent quality. Figure IV-1 is a plot which analyzes the relationship between the discharge flow and size. The flow rate which forms the basis of the proposed limitations is also shown. As shown, lines of any size have achieved the proposed flow rate. Additionally, the Agency found that the size of the operation does not affect wastewater characteristics, as all lines are operated in similar manners and the wastewater characteristics remain relatively constant regardless of size.

The relationship between flow and age was analyzed in a similar fashion. The plot of discharge flow vs. age for the two types of alkaline cleaning operations is shown in Figure IV-2. Again, the plot demonstrates that the proposed flow has been achieved at lines of all ages. Therefore, the age of a line has no significant impact on the discharge flow from that line.

The Agency investigated the effect of age on the feasibility and cost of retrofitting pollution control equipment at alkaline cleaning lines. Comparison of the age of a cleaning line with the year in which pollution control facilities were installed (see Table IV-2), demonstrate that pollution control equipment can be retrofitted. The discussion in the preceding paragraphs show that similar rates of pollutant discharge are achievable at alkaline cleaning lines of all ages. As a result, the Agency has concluded that retrofitting pollution control to alkaline cleaning lines is feasible.

Most alkaline cleaning wastewaters are treated in central treatment plants. As a result, the industry was either unable to provide retrofit costs or reported that costs were not significant. In addition, as discussed in Section VIII, a comparison of actual costs incurred by the industry with the Agency's estimated costs show that the Agency's estimates sufficiently account for any retrofit and other site-specific costs. The Agency thus concludes that the cost of retrofitting pollution control equipment at alkaline cleaning lines is minimal.

Thus, from the analysis conducted above, the Agency concludes that age and size do not affect the ability to achieve the flow rates and effluent levels which form the basis of the proposed limitations. Additionally, age and size do not affect the ability to install the appropriate pollution control technology for alkaline cleaning operations. Accordingly, the Agency concluded that further subdivision based upon size or age is not appropriate.

Geographic Location

An examination of the raw waste characteristics, process water application rates, discharge rates, effluent quality and other pertinent factors relative to plant location revealed no general relationship or pattern. Alkaline cleaning lines are located in sixteen states across the country. Most of these mills are located in the major steel producing areas of Pennsylvania and Ohio. Table IV-3 summarizes the location of all alkaline cleaning operations responding to the DCPs.

A small number of lines are located in what could be considered "arid" or "semi-arid" regions. For this reason, the Agency gave special attention to the consumptive use of water in these regions. However, because no cooling systems are required to attain the proposed limitations, no additional water consumption (or only a very minimal amount) will result from compliance with the proposed limitations.

Process Water Usage

The Agency found that although water use varies in this subcategory, water conservation practices are available to achieve fairly uniform discharge flow rates for all lines. Hence, further subdivision on the basis of water use is not warranted.

TABLE IV-1

EFFECT OF FINISHING OPERATIONS AND PRODUCT TYPE ON THE DISCHARGE FLOW RATES OF ALKALINE CLEANING OPERATIONS

Plant Code	Discharge Flow(GPT)	Type of Finishing Operation	Product Type	Type of Operation
0920-01	1	w/Electroplating	Sheet	Continuous
0584F-02	2	w/Hot Coating	Strip	Continuous
0584F-04	3	w/Hot Coating	Strip	Continuous
0728	5	Stand Alone	Pipe	Batch
0584F-03	6	w/Hot Coating	Strip	Continuous
0240C	7	w/Hot Coating	Tubes	Batch
0112A-11	12	w/Cleaning Line	Strip	Continuous
0112A-15	12	w/Cold Coating	Strip	Continuous
0112A-12	13	w/Cold Coating	Strip	Continuous
0112A-14	16	w/Cold Coating	Strip	Continuous
0240B-01	24	Stand Alone	Tubes	Batch
0240B-02	28	Stand Alone	Tubes	Batch
060N-02	42	Stand Alone	Pipe	Batch
060N-01	53	Stand Alone	Tubes	Batch
0240B-03	53	Stand Alone	Tubes	Batch
02560-01	59	w/Bright Anneal	Strip	Continuous
0112I-01	67	w/Hot Coating	Plate Washers	Batch
0760-01	88	w/Copper Coating	Coil	Continuous
0868A-03	96	w/Cold Coating	Strip	Continuous
0868A-04	133	w/Cold Coating	Strip	Continuous
0580E-01	150	w/Cold Coating	Wire	Continuous
0580D-02	150	w/Cold Coating	Wire	Continuous
0580B-02	150	w/Cold Coating	Wire	Continuous
0580-06	150	w/Brass Plating	Wire	Continuous
0868A-06	162	w/Cold Coating	Strip	Continuous
0384A	168	w/Hot Coating	Strip & Sheet	Batch
0460H	170	w/Cold Coating	Wire	Batch
0948F-01	176	w/Cold Coating	Pipe & Tube	Continuous
0856F-01	204	Stand Alone	Sheet	Continuous
0548B-01	216	w/Acid Pickling	Tubes	Batch
0112A-13	221	w/Cold Coating	Strip	Continuous
0860B-10	231	Stand Alone	Sheet	Continuous
068-03	236	w/Acid Pickling	Rod	Batch
0868A-05	243	w/Galv. Line	Sheet	Continuous
0868B-04	245	w/Annealing Line	Sheet	Continuous
0864B-05	250	w/Degreasing Line	Strip	Continuous

TABLE IV-2

EXAMPLES OF PLANTS THAT HAVE DEMONSTRATED THE ABILITY TO RETROFIT POLLUTION CONTROL EQUIPMENT ALKALINE CLEANING SUBCATEGORY

Plant Code	Plant Age (Year)	Treatment Plant Age (Year)
112I	1922	1950
240B	1965	1968
248C	1973	1975
256N	1965	1973
384A	1968	1970
476A	1960	1977
548	1927	1969
548A	1957	1967
580A	1962	1967
636	1943	1974
728	1952	1971
776D	1948	1973
856Q	1947	1963

And ten others.

TABLE IV-3

LOCATION OF ALKALINE CLEANING OPERATIONS

Location	Total Number	% of Total
Pennsylvania	55	31.4
Ohio	22	12.6
Indiana	18	10.3
Maryland	15	8.6
Massachusetts	11	6.3
Michigan	10	5.7
West Virginia	8	4.6
Alabama	8	4.6
California	7	4.0
Texas	5	2.9
Wisconsin	5	2.9
Georgia	3	1.7
Illinois	3	1.7
Kentucky	3	1.7
Connecticut	1	0.5
Mississippi	1	0.5
# of States = 16	175	100%

FIGURE IV-1
FLOW vs SIZE ANALYSIS
ALKALINE CLEANING SUBCATEGORY

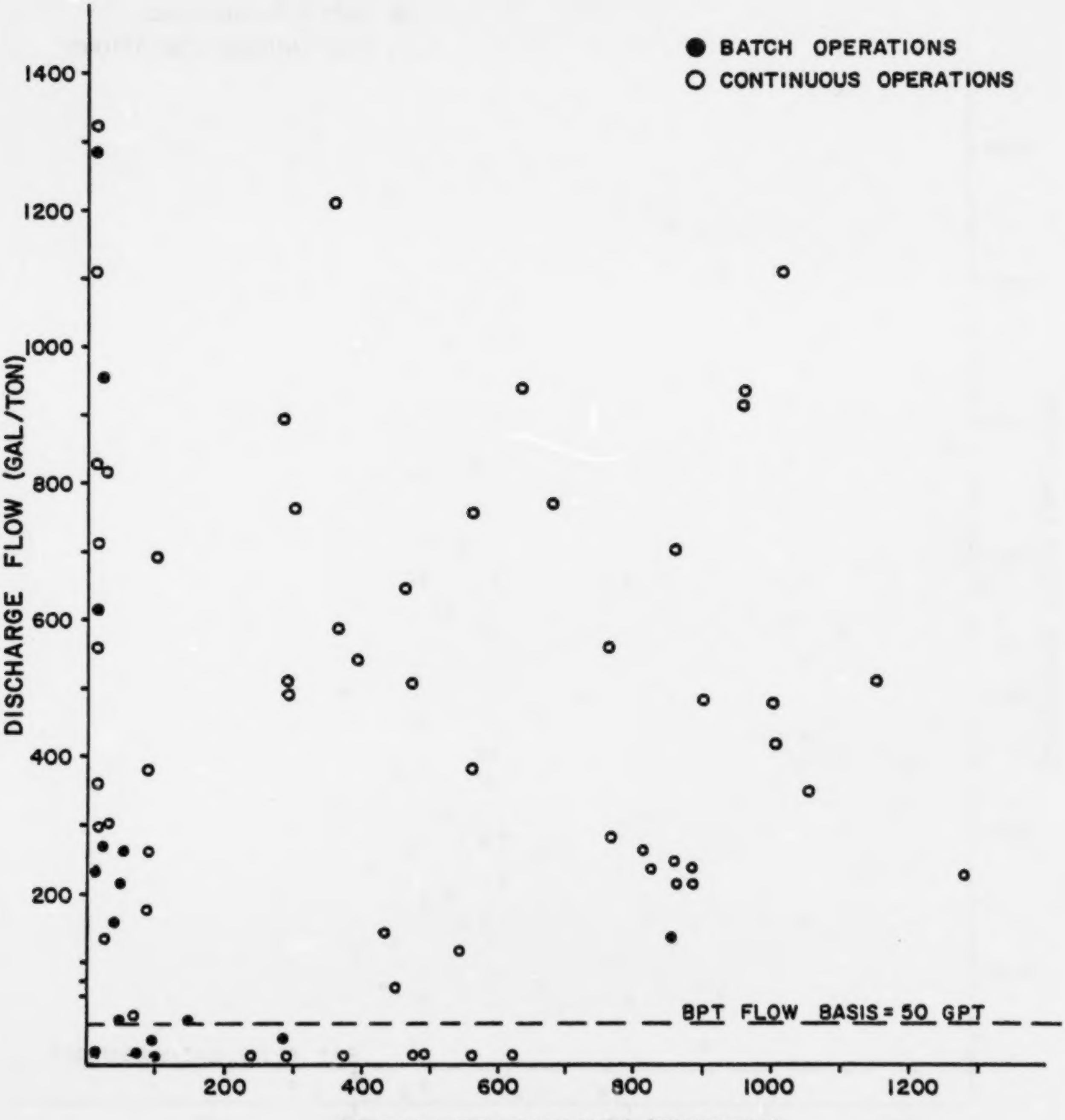
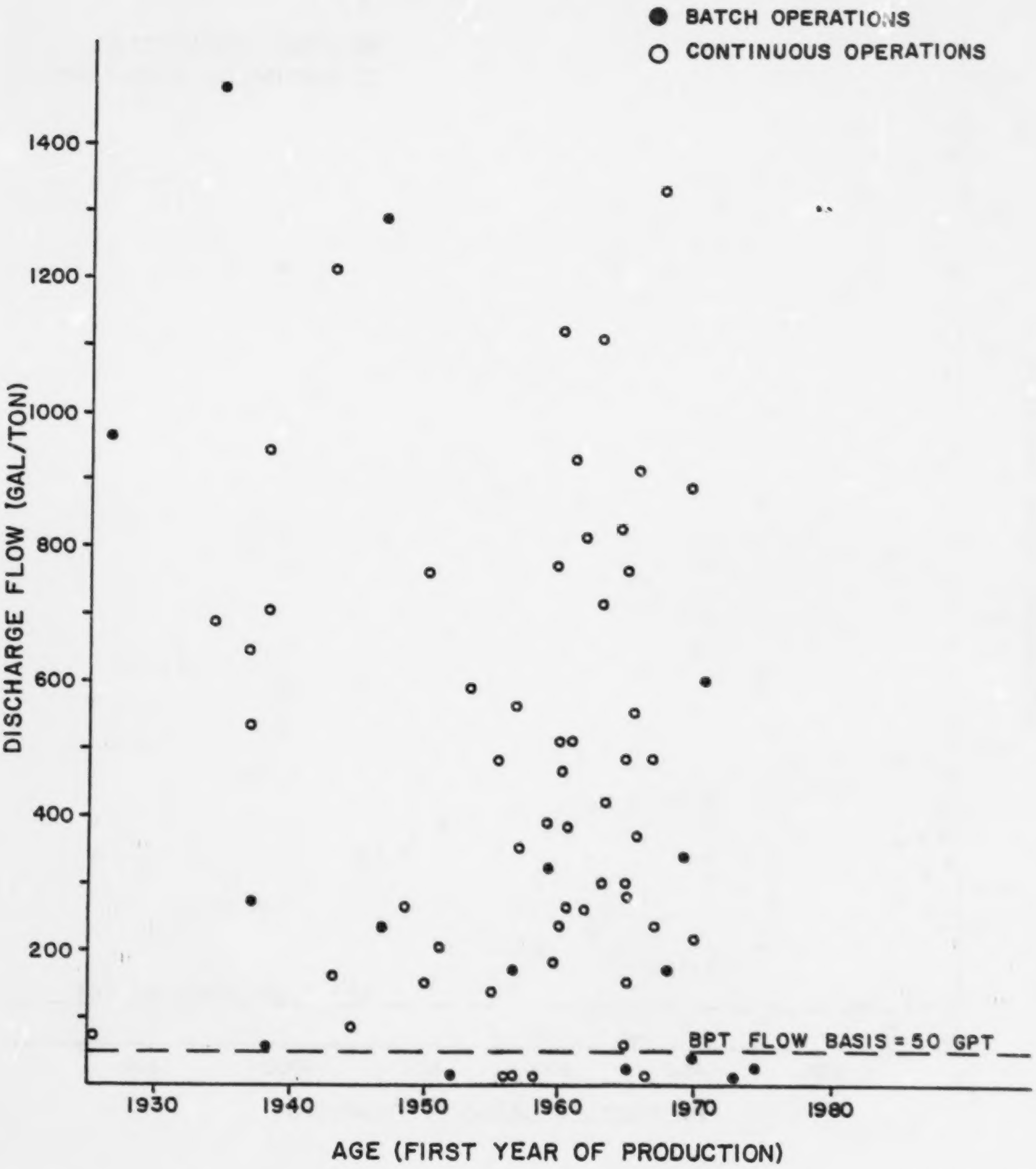


FIGURE IV-2

FLOW vs AGE ANALYSIS
ALKALINE CLEANING SUBCATEGORY



ALKALINE CLEANING SUBCATEGORY

SECTION V

WATER USE AND WASTE CHARACTERIZATION

Introduction

Process water usage within the alkaline cleaning subcategory is a major factor in determining pollutant loads and estimating the cost for removal of pollutants. The Agency analyzed the data from the sampling inspections and the DCP responses to evaluate process water usage within this subcategory and to obtain total wastewater volumes.

Alkaline Cleaning Operations

As shown in Figures III-1 and III-2, alkaline cleaning is accomplished in batch and continuous operations. In both operations, the product is cleaned in alkaline solutions prior to entering other finishing operations. As explained in the preceding sections, because these operations are carried out in a similar manner, the flow rates and wastewater characteristics do not vary significantly from operation to operation. Where flows do vary, water conservation methods can be applied to reduce water usage.

Wastewaters are discharged from two sources at alkaline cleaning lines: the cleaning solution tank, and in the subsequent rinsing steps. The cleaning solution tank contains a caustic solution which generally has high levels of sodium compounds and other constituents depending on the type of solution used. Some lines reuse the cleaning solution continuously, adding fresh solution only to make up for dragout and evaporative losses. However, due to the buildup of contaminants (dissolved solids and oils) in the baths, the contents of the bath are discharged periodically or as soon as the cleaning ability of the solution is impaired by the build-up of contaminants. A process is being developed that employs an ultrafiltration system which continuously treats the alkaline cleaning solutions and enables them to be reused with a minimal loss. The solutions in the alkaline cleaning tanks are sometimes heated to increase the chemical action of the degreasing agents. As a result, the temperatures of the wastes discharged from the bath are as high as 93.3°C (200°F). Wastewaters from all alkaline cleaning lines are treated in large central treatment systems. For this reason, the high temperature does not present a problem to the environment.

Because most alkaline cleaning baths are used to process a large amount of product, pollutants can build up in the tank to extremely high levels. Typical levels of pollutants found in alkaline cleaning baths are shown below:

Pollutant or Wastewater Characteristic	Typical Values (mg/l)
Alkalinity	1,000
Iron, total	100
Oil & Grease	1,500
pH (units)	12-13
Total Dissolved Solids	25,000
Total Suspended Solids	1,000
Temperature	70°-200°F

The other source of wastewaters from the alkaline cleaning process is the rinse steps following the cleaning operation. After immersion of the product into the cleaning bath, rinsing is required to remove residual cleaning solution from the product and to cool the product if the cleaning bath was heated. The rinsing is usually done in dip tanks or spray chambers, and there can be either one or several tanks depending upon the degree of rinsing required. Although some mills use standing rinse tanks (no continuous flow through the tanks) many mills use rinse tanks that have continuous water feed and overflows. This is done to keep the rinsewater relatively free of contaminants and to cool the product, if necessary.

The Agency obtained sampling data for the three mills visited during this study. The rinsewater was sampled at each mill. Because the discharges from batch and continuous operations are similar, the data for these operations have been combined. It should be noted that Plant 0432K was visited twice, but only the data gathered during the most recent visit are included. The data gathered at the three sampled plants are presented in Table V-1. Net concentrations are listed in this table because the Agency believes that net values best describe pollutants contributed by the alkaline cleaning operation as opposed to comtamination in makeup waters. Averages are also listed, where appropriate, to show a typical level of pollutants that can be expected in the rinsewater from the alkaline cleaning process.

TABLE V-1

SUMMARY OF ANALYTICAL DATA OF SAMPLED PLANTS
ALKALINE CLEANING SUBCATEGORY
NET CONCENTRATIONS OF POLLUTANTS IN RAW WASTEWATERS(1)

Reference Code	0176-01	0112I-04	0432K	
Plant Code	152	156	157	Average
Sample Points	(V-W)	(C-A)	(C-A)	
Flow (gal/ton)	815	67	254	379
Type of Mill	Continuous	Batch	Continuous	-
Dissolved Iron	0.08	0.3	0.03	0.14
Oil & Grease	4.0	6.5	18.3	9.6
Suspended Solids	-	10.0	15.7	8.6
pH, units	8.9-9.1	7.2-8.1	10.3-11.7	7.2-11.7
23 Chloroform	0.020	ND	ND	*
36 2,6-Dinitrotoluene	ND	ND	0.047	0.016
39 Fluoranthene	-	ND	0.051	0.017
64 Pentachlorophenol	ND	0.029	ND	*
65 Phenol	ND	ND	0.024	*
66 Bis(2-ethylhexyl)phthalate	ND	0.015	0.48	0.17
68 Di-n-butyl phthalate	ND	ND	0.086	0.029
69 Di-n-octyl phthalate	ND	ND	0.031	0.010
71 Dimethyl phthalate	ND	ND	0.12	0.040
73 Benzo(a)pyrene	ND	ND	0.01	*
84 Pyrene	ND	ND	0.032	0.010
85 Tetrachloroethylene	0.027	ND	-	*
114 Antimony	NR	NR	0.030	0.010
119 Chromium	ND	0.025	-	*
121 Cyanide, Total	0.034	*	ND	0.010
122 Lead	0.015	0.025	-	0.013
124 Nickel	0.015	*	-	*
125 Selenium	NR	NR	0.068	0.023
128 Zinc	-	0.23	-	0.077

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* : Less than 0.010 mg/l
NR: Not reported
ND: Not detected

(1) All values are in mg/l unless otherwise noted.
(-) Calculation yielded a negative value.

ALKALINE CLEANING SUBCATEGORY

SECTION VI

WASTEWATER POLLUTANTS

This section describes the wastewater pollutants characteristic of alkaline cleaning operations and the basis for the Agency's selection of those pollutants for which limitations are proposed. The first step in this process involved the development of a list of pollutants considered to be representative or characteristic of the alkaline cleaning process. This list is based upon data gathered during the original study and through DCP responses.

This initial list of pollutants was confirmed by data collected from field sampling conducted during this study. A review of the analytical data for the wastewater samples collected during all of the field sampling programs formed the basis for the final selection of pollutants for which limitations are being proposed for alkaline cleaning operations.

In the originally promulgated limitations, five pollutants were limited, including total suspended solids, dissolved iron, dissolved chromium, dissolved nickel and pH. In these proposed limitations, the Agency has selected different pollutants for limitation. The Agency is not proposing limitations for dissolved chromium, iron or nickel. Additional information on these proposed changes are provided below.

The Agency is proposing to eliminate limitations for dissolved nickel, chromium, and iron. In the originally promulgated limitations, these pollutants were limited because high levels were detected at the one mill which was sampled (Plant I). However, the wastewater monitored at this mill was a combination of wastewaters from pickling and alkaline cleaning operations. The Agency now believes that the levels of these three pollutants are most likely attributable to the pickling wastes and not to the alkaline cleaning wastewaters. This conclusion is based upon the additional data collected at the three other plants for this study. Those data show that the concentrations of these three pollutants in the wastewaters from the alkaline cleaning operations are very low, with average levels of about 0.01 mg/l.

The wastewater from the alkaline cleaning process is relatively clean in comparison to wastewaters from other steelmaking operations. However, there is the potential for high concentrations of various pollutants in the discharge from the mills. Suspended solids, oil and grease, toxic metals (antimony, lead, selenium, and zinc) and high pH are characteristic of the alkaline cleaning wastewaters. These pollutants are generated in the rinse tanks and the cleaning baths.

The suspended solids and toxic metal pollutants originate when the dirt, soot and scale are removed from the steel product in the cleaning bath. Because the solution is not as aggressive as some of the other cleaning steps (i.e., pickling and scale removal), the solutions do not contain high concentrations of most toxic metal pollutants. Solids, both total and dissolved, are the principal pollutants washed off the surface of the metal. In addition, the cleaning baths are used to remove oil coatings that may have been applied to the steel product to prevent rust formation during storage. This oil is washed off during the process and enters the wastewaters. The discharges from the cleaning mills also have a high pH. This results from the alkaline solutions that are used in the process. pH levels of 9-12 are commonly found in alkaline cleaning wastewaters.

Sampling of toxic pollutants was performed. The Agency did not expect to find these pollutants to be present at significant levels. However, the possibility existed that some toxic pollutants may be present in some of the substances or solutions used in the cleaning process. A list was developed which summarizes the toxic pollutants known to be present in alkaline cleaning wastewaters (Table VI-1). This list is based upon data gathered from the sampling visits and responses by the industry.

Using the sampling data, the Agency calculated a net concentration value for each pollutant found in the raw wastewaters. A net raw value was used because this value best describes the contribution of pollutants from the alkaline cleaning process. If one of the pollutants was found to be in the raw wastewater at an average concentration (net) of 0.010 mg/l or greater, the Agency considered it to be characteristic of alkaline cleaning wastewaters and is addressed accordingly throughout this report. The list of the toxic pollutants determined to be characteristic of the alkaline cleaning subcategory is presented in Table VI-2. Also included in this table are the nontoxic pollutants determined to be characteristic of the process.

Five additional pollutants were detected at an average concentration greater than 0.010 mg/l but are not listed in Table VI-1 or VI-2. The Agency believes that their presence is not attributable to alkaline cleaning operations. Methylene chloride was detected at high concentrations but was omitted because the Agency believes that this pollutant is not present in alkaline cleaning wastewaters. This compound is commonly used as a cleaning agent in the laboratory and its presence is ascribed to this practice; not to the alkaline cleaning operation. Also, four phthalate compounds were detected at levels greater than 0.010 mg/l. Evidence developed during the sampling inspections indicates that their origin was probably related to plasticizers in the tubing used in collecting the samples automatically.

Based upon the analysis conducted above and in Section V, it appears that none of the toxic pollutants are present in the wastewaters from alkaline cleaning mills at concentrations at levels sufficient to warrant limitation at the BAT level. All the pollutants are present in concentrations that are below practical treatability levels. Aside from reducing the BPT effluent through recycle or water conservation practices, there are no economically achievable treatment technologies that EPA is aware of to reduce the loading of those pollutants by a significant amount. Recycle is being practiced at only one plant in this subcategory. However, the alkaline cleaning wastewaters at this plant are mixed with other wastewaters, and the combined waste stream is reused at different processes. The Agency has no other information regarding recycling of alkaline cleaning wastewaters or water conservation practices (such as cascade rinsing) which can be applied at these operations. As a result, the Agency has been unable to assess the feasibility of reducing discharge flow rates of alkaline cleaning operations. The Agency is, therefore, soliciting comments and information on the feasibility of flow reduction for the alkaline cleaning subcategory.

TABLE VI-1

TOXIC POLLUTANTS KNOWN TO BE PRESENT IN ALKALINE CLEANING WASTEWATERS

Toxic Pollutant	
23.	Chloroform
36.	2,6-Dinitrotoluene
39.	Fluoranthene
64.	Pentachlorophenol
65.	Phenol
73.	Benzo(a)pyrene
84.	Pyrene
85.	Tetrachloroethylene
114.	Antimony
119.	Chromium
121.	Cyanide, Total
122.	Lead
123.	Nickel
125.	Selenium
128.	Zinc

TABLE VI-2

SELECTED POLLUTANT PARAMETERS
ALKALINE CLEANING SUBCATEGORY

	Dissolved Iron
	Oil & Grease
	Total Suspended Solids
	pH
36	2,6-Dinitrotoluene
39	Fluoranthene
84	Pyrene
114	Antimony
121	Cyanide, Total
122	Lead
125	Selenium
128	Zinc

ALKALINE CLEANING SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

Introduction

A review of the control and treatment technologies currently in use or available for use in the alkaline cleaning subcategory provided the basis for selecting and establishing the BPT, BCT, and NSPS alternative treatment systems. This review involved summarizing questionnaire and plant visit data in order to identify those treatment components and systems in use at alkaline cleaning operations. The Agency analyzed which treatment components and systems were most appropriate for the various levels of treatment. This section also presents the raw wastewater and treated effluent analytical data for the plants sampled, and a short description of the treatment at each of the sampled plants.

Summary of Treatment Practices Currently Employed

As explained previously, wastewater in the alkaline cleaning operations is generated in the cleaning tanks and the the rinse steps following the cleaning operation. The wastewater and treatment techniques practiced by the operating alkaline cleaning mills vary considerably, but most tend to have similar components to reduce levels of the pollutants present. The Agency used the data from the DCPs and the plant visits to determine the treatment methods practiced at alkaline cleaning operations. Based upon these data, the Agency developed the following summary of disposal and treatment techniques:

	No. of Operations Choosing This Treatment and/or Disposal Practice	% of Total
No. of mills providing treatment of any kind	106	60.6
No. of mills discharging to a POTW system	44	25.1
No. of mills having wastes hauled	12	6.9
No. of mills that do not provide any treatment	13	7.4
TOTAL	175	100%

As explained earlier, all alkaline cleaning lines that provide treatment do so in central treatment systems. These treatment systems usually include wastewaters from operations that have similar or compatible wastewater characteristics and thus are designed primarily to reduce the levels of suspended solids, oils, greases, and dissolved metals as well as to neutralize the pH of the discharge. The type of treatment operations at the mills surveyed are outlined below.

The first treatment step that is carried out at many of the alkaline cleaning operations is equalization. Because of the potential for batch discharges to originate in the process and for other waste sources to be combined with the alkaline cleaning wastes, wastewaters are collected in a sump or pit at many lines with sufficient retention time to equalize the wastewater prior to subsequent treatment.

Because of the presence of oils and greases in the wastewaters, oil separation is usually practiced. Several methods are used in this subcategory (i.e., API separation, trough type, belt type skimmer), but surface skimming in the equalization basin is often practiced.

After equalization and oil separation, the wastewaters are neutralized. The DCP responses indicate that this is done in two ways. If the other wastewaters entering the central treatment system are acidic, then the alkalinity of the wastewaters from the alkaline cleaning operations are neutralized to the required pH range by comingling with those other wastewaters. This practice is common at many mills, as it reduces chemical costs. If acidic wastewaters are not present in the central treatment systems, then acid must be added to the alkaline cleaning wastewaters for neutralization. The cost of this system is higher than other types of neutralization systems because of the amount of acid required to neutralize the alkalinity of the wastewater. Only 17% of the alkaline cleaning lines have auxiliary acid addition systems installed in the event that the other wastewaters entering the central treatment system do not neutralize the wastewaters sufficiently.

After neutralization and oil skimming, polymers are usually added in a mixing tank to promote flocculation. These agents are useful in promoting settling in clarification systems. Various chemical agents are used to achieve optimum settling, depending on the exact nature of the wastes.

After equalization, oil skimming and chemical addition, removal of the suspended solids and metals is commonly practiced in central treatment systems that include alkaline cleaning wastewaters. This is done in a variety of ways within this subcategory. Seven alkaline cleaning operations use settling lagoons as a sedimentation device. Eighteen use flocculation-clarifiers alone, or in conjunction with settling lagoons, and two use thickeners to achieve solids and metals removal. Additionally, there are four operations that employ filtration to reduce pollutant loads. The choice of clarification or filtration devices depends upon the amount of land available for installation of the treatment system and the other types of wastewaters that are treated in the central treatment systems.

In the clarification or filtration step, sludges are generated as solids, oils, and precipitated metals are removed from the wastewaters. Large volumes of sludge can be generated depending upon the wastewaters being treated and the type of neutralization carried out. Three types of solid waste dewatering devices - centrifuges, thickeners and vacuum filters - are used in this subcategory to reduce the volumes of solid waste generated.

Advanced Treatment Systems Considered for the Alkaline Cleaning Subcategory

As shown in Section V, none of the toxic organic or inorganic pollutants were detected above treatability levels in alkaline cleaning wastewaters. For this reason, the Agency did not consider additional wastewater treatment components that would achieve further concentration reductions of the toxic pollutants. Instead, the Agency considered advanced treatment systems which would reduce or eliminate the wastewater flow from the alkaline cleaning operation and thus reduce the pollutant load being discharged.

A description of the advanced treatment alternatives considered by the Agency for alkaline cleaning operations, is set out below. These systems have been demonstrated, to varying degrees, in the alkaline cleaning subcategory or in other industrial applications on wastewaters with characteristics similar to those generated in the alkaline cleaning operation.

1. Ultrafiltration

Ultrafiltration (UF) is a pressure driven process for separating high molecular weight solutes or colloids from water solutions by means of a permeable membrane. The wastewater is filtered by passing it through the membrane under low pressure.

This process is now being developed for use on alkaline cleaning baths. These baths are quite amenable to ultrafiltration, resulting in the concentration of the dilute oily waste and the recycle of the alkaline cleaning chemicals. Since UF membranes allow only the low molecular weight solutes and water to pass through, the emulsified oil and particulates are held back and concentrated. The concentrate is not returned to the cleaner bath and serves to remove the soil and oily waste from the cleaning system. The main components of the cleaning solutions, the alkali and builders, are generally low molecular weight solutes. These materials pass through the membrane freely and are returned to the cleaner bath.

By using this system, the amount of pollutants discharged from the cleaning bath is reduced significantly. This reduces chemical costs needed to make up the solutions, improves the cleaning characteristics of the bath and reduces the pollutant load generated by the alkaline cleaning process.

While no data are presently available regarding the application of this technology to alkaline cleaning solutions, it is expected that this system will work quite effectively. Although the technology can be costly, a payback period of less than 3 years is predicted because of the saving achieved due to the reuse of the cleaning solutions. While the installation of this treatment system would reduce the pollutants in the cleaning baths, the rinsewater would still require treatment.

2. Vapor Compression Distillation (Evaporation)

Vapor compression distillation is typically used to concentrate a high dissolved solids wastestream (3,000-10,000 mg/l) to a slurry consistency (approximately 100,000 mg/l). The slurry discharge can be dried in a mechanical drier or allowed to crystallize in a small solar or steam-heated pond prior to final disposal. The distillate quality water generated by this system can be recycled to the alkaline cleaning operation thereby eliminating all discharges to navigable waters. One desirable feature of this unit is its relative freedom from scaling. Because of the unique design of the system, calcium sulfate and silicate crystals grow in solution as opposed to depositing on heat transfer surfaces. Economic operation of this system requires a high calcium to sodium ratio (hard water).

Due to economic considerations, only limited application is made of vapor compression distillation in processing wastewater. Vapor compression distillation may be the only possible means to achieve zero discharge of process water for alkaline cleaning operations.

3. Cascade or Counter-Current Rinse System

The installation of a cascade rinse system can drastically reduce the rinsewater flows discharged from the alkaline cleaning process. This system replaces or modifies the existing rinsing system to achieve a multiple tank arrangement in series. The water flow to the tanks is reduced and cascades from one tank to the next. The product being cleaned travels in the opposite direction to the water flow and thus encounters progressively cleaner water. This type of arrangement reduces the wastewater flow (i.e., the waste volume), concentrates the pollutants in the first rinsing chamber and achieves a more thorough rinsing because of the multiple rinsing achieved in the series of tanks. Although this type of rinsing is ideally suited for continuous operations it can also be implemented at batch type operations. The rinsing operation carried out in the alkaline cleaning process is similar to the rinsing operations in pickling and hot coating which include cascade rinse systems. Therefore, there is a great potential for the use of this system at alkaline cleaning operations.

4. Reuse Systems

As the wastewaters from alkaline cleaning operations are relatively clean after treatment, there is a great potential for reuse. While reuse rates up to 100% were demonstrated, these high rates where achieved mainly because the alkaline cleaning wastewaters were diluted with other wastes in large central treatment systems. A reuse rate of 50% to other processes has been demonstrated at numerous lines. This rate was also achieved at a line with a separate treatment system.

5. Recycle Systems

The low pollutant concentrations associated with alkaline cleaning wastewaters provide a great potential for recycle of the treated effluent. A recycle system could significantly decrease the discharge from alkaline cleaning operations. With a recycle rate of 90%, the proposed BPT flow of 50 gal/ton could be reduced to 5 gal/ton. Limited use of this technology (one plant, 0112D) has been demonstrated throughout the alkaline cleaning subcategory. The one plant using recycle has two lines in operation. Fifty and ninety percent of the process water required by these two lines is central treatment effluent supplied using recycle systems. In addition to flow reduction, recycle systems also decrease the pollutant load being discharged.

Summary of Sampling Visit Data

Three alkaline cleaning lines were visited for this study: two continuous operations and one batch operation. Table VII-2 presents the raw wastewater and effluent analytical data for these lines. Table VII-1 provides a legend for the various control and treatment technology abbreviations used on the above table and in other tables throughout this report. The concentration values presented in Table VII-2 represent, except where footnoted, gross average values. In some cases these data were obtained from central treatment systems. A brief discussion of each wastewater treatment system follows. Additional detail is presented for each wastewater system in the respective flow diagrams.

Plant 152 - Figures VII-1 and VII-2

Wastewaters from alkaline cleaning operations are discharged to a complex central treatment system. The sources of wastewaters to the central treatment system are shown in Figure VII-1 and the schematic for the treatment system is shown in Figure VII-2. The alkaline cleaning wastewaters, which comprise approximately 1% of the total flow to the central treatment system, are discharged directly to the central treatment system without pretreatment.

The wastewaters combine with wastewaters from approximately twenty other sources and undergo equalization and neutralization, flocculation with polymers, and clarification with oil skimming. Sludge formed in the treatment process is dewatered in mechanical centrifuges. The effluent from this system is discharged to a receiving stream.

PlanT 156 - Figure VII-3

A complex central treatment system is also used at this plant. The alkaline cleaning wastes comprise less than 1% of the total flow. The alkaline cleaning solutions and rinses are combined with wastewaters from other sources and then undergo equalization, neutralization and primary clarification in a thickener. From the clarifier, the wastewaters enter a high-density-sludge (HDS) unit where the solids and metals are settled out. The overflow from the HDS unit is then filtered. The filtrate is discharged to a final polishing lagoon where additional settling and temperature equalization is carried out prior to discharge to a receving stream.

Plant 157 and I - Figure VII-4

The alkaline cleaning wastewaters from this mill are also treated in a central treatment system. The two sources of wastewater from the alkaline cleaning operation are treated differently.

The rinsewater from the process is treated with rinsewaters from other process lines and receives only neutralization and settling in lagoons prior to discharge. The spent cleaning solutions are collected and used to help neutralize spent pickle liquor generated in nearby pickle lines. After being mixed with the waste pickle liquor, the combined wastes enter the settling lagoons where some sedimentaiton occurs. The alkaline cleaning wastes at this plant make up less than 1% of the total flow to the central treatment system.

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. Operating Modes

1. OT — Once-Through

2. Rt,s,n — Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n — Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn — Blowdown, where n = discharge as % of raw waste flow

B. Control Technology

10. DI — Deionization

11. SR — Spray/Fog Rinse

12. CC — Countercurrent Rinse

13. DR — Drag-out Recovery

C. Disposal Methods

20. H — Haul Off-Site

21. DW — Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

D. Treatment Technology (cont.)

43.	FLt	Flocculation, where t = type t: L = Lime A = Alum P = Polymer M = Magnetic O = Other, footnote
44.	CY	Cyclone/Centrifuge/Classifier
44a.	DT	Drag Tank
45.	CL	Clarifier
46.	T	Thickener
47.	TP	Tube/Plate Settler
48.	SLn	Settling Lagoon, where n = days of retention time
49.	BL	Bottom Liner
50.	VF	Vacuum Filtration (of e.g., CL, T, or TP underflows)
51.	Ft,m,h	Filtration, where t = type m = media h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52.	CLt	Chlorination, where t = type t: A = Alkaline B = Breakpoint
53.	CO	Chemical Oxidation (other than CLA or CLB)

D. Treatment Technology (cont.)

54. BOt Biological Oxidation, where t = type

t: An = Activated Sludge
n = No. of Stages
T = Trickling Filter
B = Biodisc
O = Other, footnote

55. CR Chemical Reduction (e.g., chromium)

56. DP Dephenolizer

57. ASt Ammonia Stripping, where t = type

t: F = Free
L = Lime
C = Caustic

58. APt Ammonia Product, where t = type

t: S = Sulfate
N = Nitric Acid
A = Anhydrous
P = Phosphate
H = Hydroxide
O = Other, footnote

59. DSt Desulfurization, where t = type

t: Q = Qualifying
N = Nonqualifying

60. CT Cooling Tower

61. AR Acid Regeneration

62. AU Acid Recovery and Reuse

63. ACt Activated Carbon, where t = type

t: P = Powdered
G = Granular

64. IX Ion Exchange

65. RO Reverse Osmosis

66. D Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
ALKALINE CLEANING SUBCATEGORY

Raw Wastewaters

	Reference Code	0176-01		01121-04		0432K		Average	
	Plant Code	152		156		157			
	Sampling Point	V		C		C			
	Flow(gal/ton)	8.5		67		254		379	
	Type of Mill	Continuous		Batch		Continuous			
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Dissolved Iron	0.10	0.00034	0.34	0.000095	0.70	0.00074	0.38	0.00039
	Oil & Grease	8.0	0.027	9.0	0.0025	21.3	0.023	12.8	0.018
	Suspended Solids	3.5	0.012	11.0	0.0031	16.7	0.018	10.4	0.011
	pH, units	8.9-9.1		7.2-8.1		10.3-11.7		7.2-11.7	
36	2,6-Dinitrotoluene	ND	ND	ND	ND	0.047	0.000050	0.016	0.00017
39	Fluoranthene	ND	NS	*	Neg.	0.051	0.000054	0.020	0.000018
84	Pyrene	ND	ND	*	Neg.	0.032	0.000034	0.014	0.000011
114	Antimony	NR	NR	NR	NR	0.048	0.000051	0.048	0.000051
121	Cyanide, Total	0.053	0.00018	0.003	Neg.	ND	ND	0.019	0.000060
122	Lead	0.065	0.00022	0.075	0.000021	0.060	0.00006[illegible]	0.067	0.000010
125	Selenium	NR	NR	NR	NR	0.070	0.0000[illegible]4	0.070	0.000074
128	Zinc	0.03	0.00010	0.30	0.000084	0.049	0.000052	0.13	0.000079

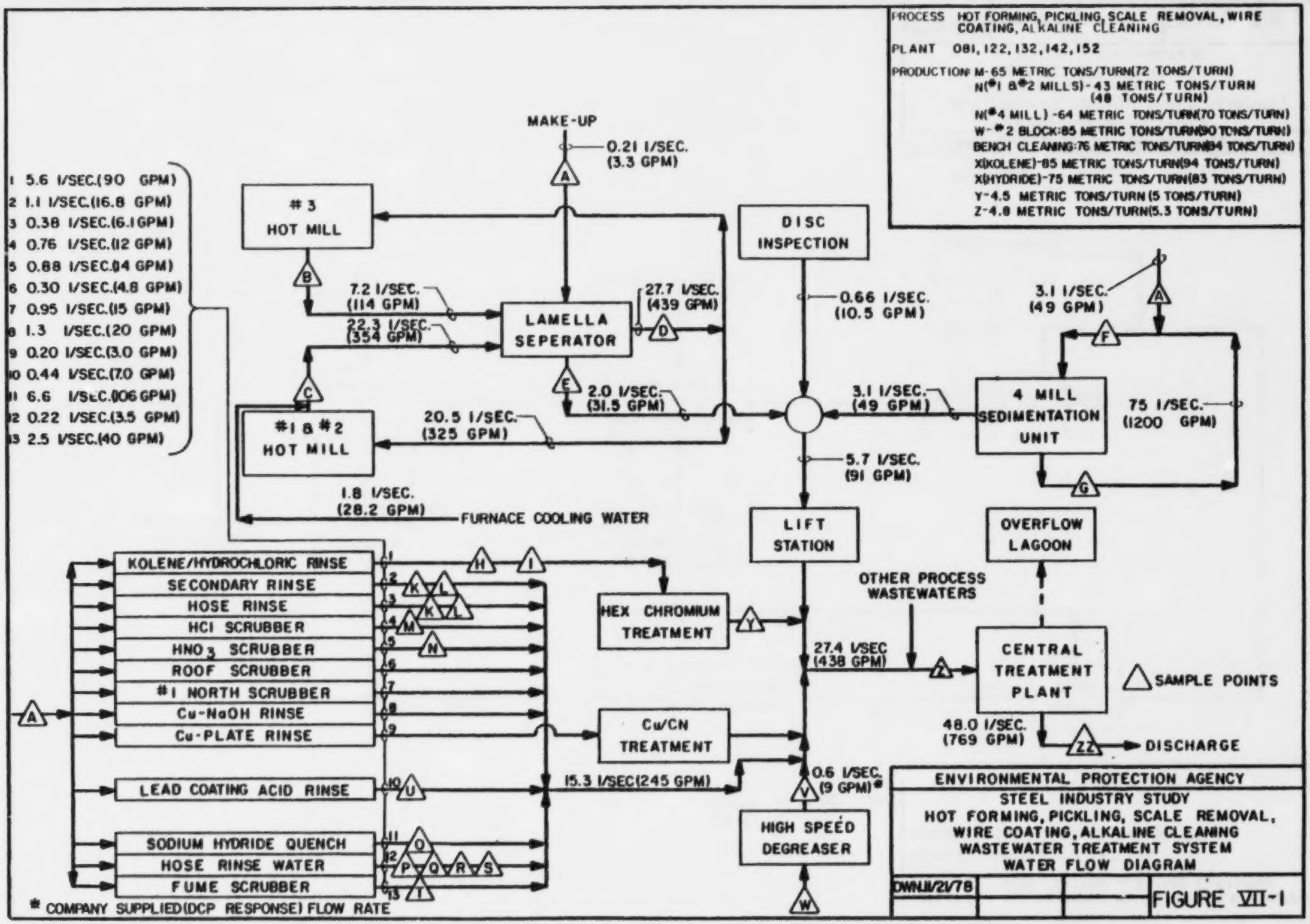
Effluents

	Reference Code	0176-01(1)		01121-04		0432K	
	Plant Code	152		156		157	
	Sampling Point	(V/Z)(ZZ)		H		D	
	Flow(gal/ton)	815		67		254	
	C&TT	E,FLP,NC,NW,NA,CL,T,VF		E,NW,ML,T,FDS		NL,SL(UNK)	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Dissolved Iron	0.8	0.0000012	0.045	0.000013	18.0	0.019
	Oil & Grease	4.5	0.0039	4.0	0.0011	4.0	0.0042
	Suspended Solids	16.5	0.00048	1.0	0.00028	91.7	0.097
	pH, units	7.2-7.9		7.3-7.7		5.6-6.7	
36	2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
39	Fluoranthene	*	ND	*	Neg.	ND	ND
84	Pyrene	*	ND	*	Neg.	ND	ND
114	Antimony	NR	NR	NR	NR	0.038	0.000040
121	Cyanide, Total	0.035	0.0025	0.001	Neg.	ND	ND
122	Lead	0.05	0.00015	0.075	0.000021	0.60	0.00064
125	Selenium	*	NR	NR	NR	ND	ND
128	Zinc	0.04	Neg.	0.13	0.000036	0.29	0.00031

NOTE: For a definition of C&TT codes, See Table VII-1.

(1) The lbs/1000 lbs value for this operation cannot be derived directly from the concentrations and flow rates shown.

* : Less than 0.010 mg/l
Neg: Less than 0.0000010 lbs/1000 lbs
ND : Not Detected
NR : Not Reported



PROCESS HOT FORMING, PICKLING, SCALE REMOVAL, WIRE COATING, ALKALINE CLEANING

PLANT 081, 122, 132, 142, 152

PRODUCTION: M-65 METRIC TONS/TURN(72 TONS/TURN)
N(#1 & #2 MILLS)-43 METRIC TONS/TURN (48 TONS/TURN)
N(#4 MILL)-64 METRIC TONS/TURN(70 TONS/TURN)
W-#2 BLOCK:85 METRIC TONS/TURN(90 TONS/TURN)
BENCH CLEANING:76 METRIC TONS/TURN(84 TONS/TURN)
X(KOLENE)-85 METRIC TONS/TURN(94 TONS/TURN)
X(HYDRIDE)-75 METRIC TONS/TURN(83 TONS/TURN)
Y-4.5 METRIC TONS/TURN(5 TONS/TURN)
Z-4.8 METRIC TONS/TURN(5.3 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING, PICKLING, SCALE REMOVAL, WIRE COATING, ALKALINE CLEANING WASTEWATER TREATMENT SYSTEM WATER FLOW DIAGRAM

DWN.II/21/78

FIGURE VII-1

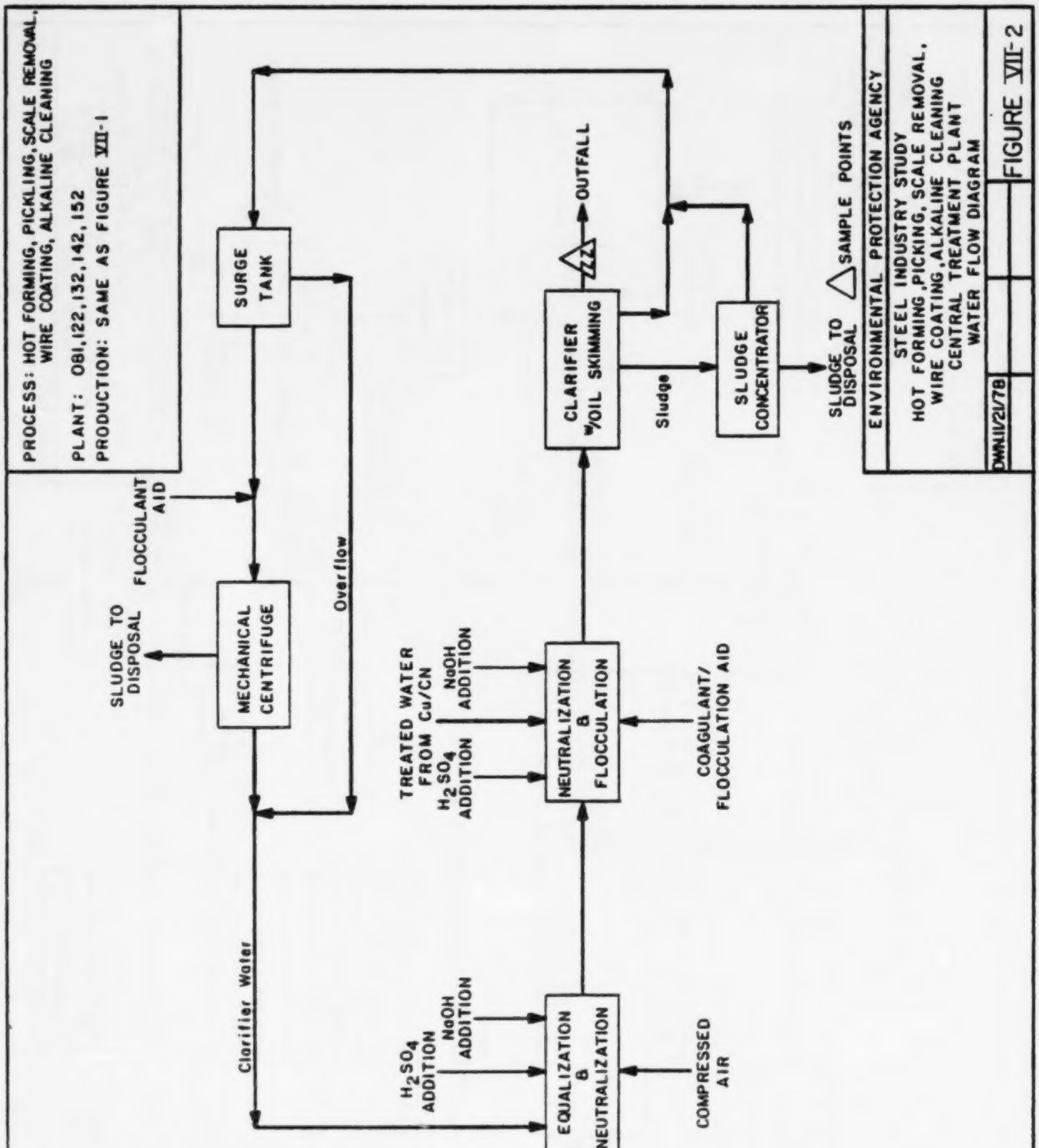
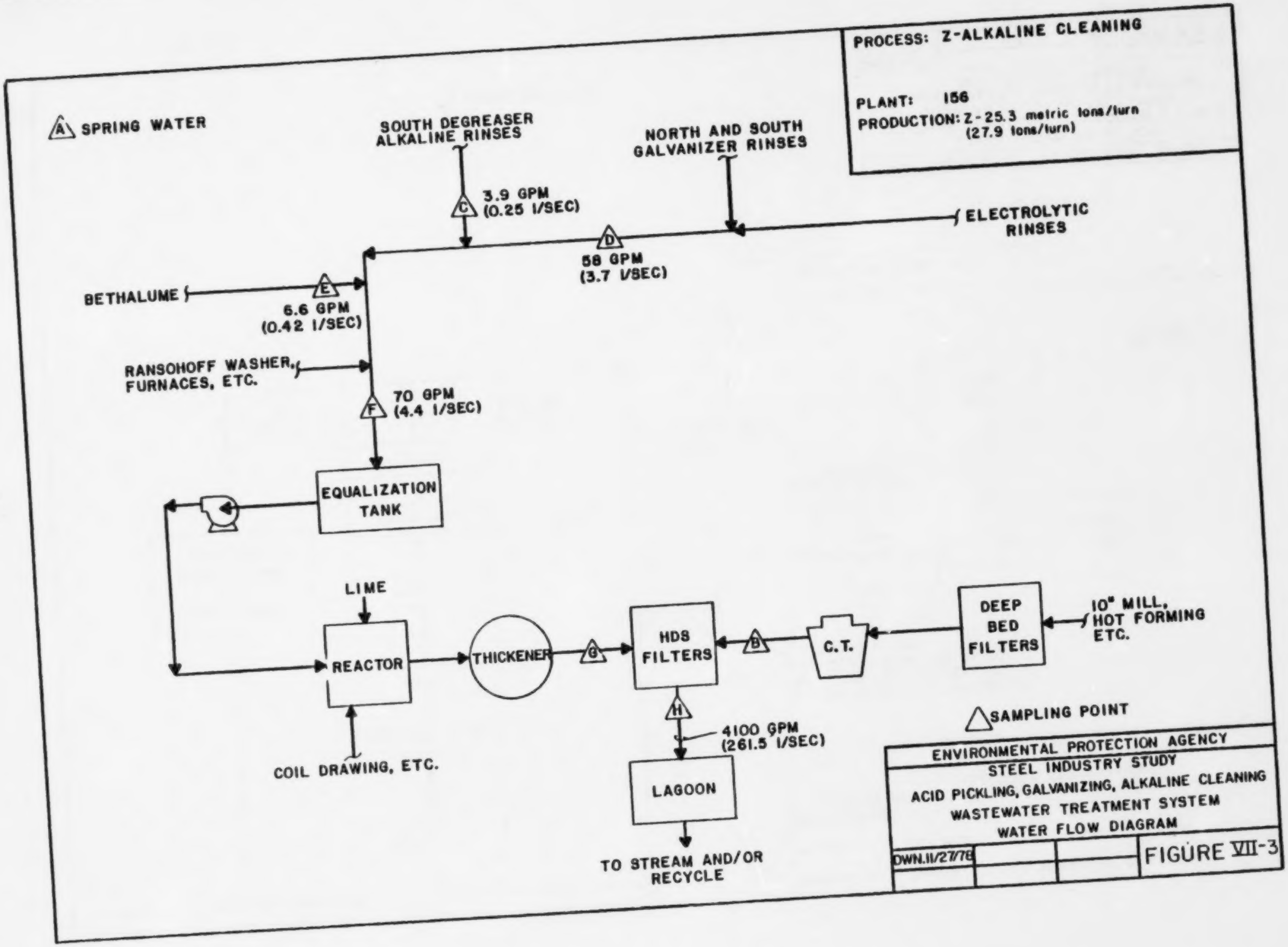
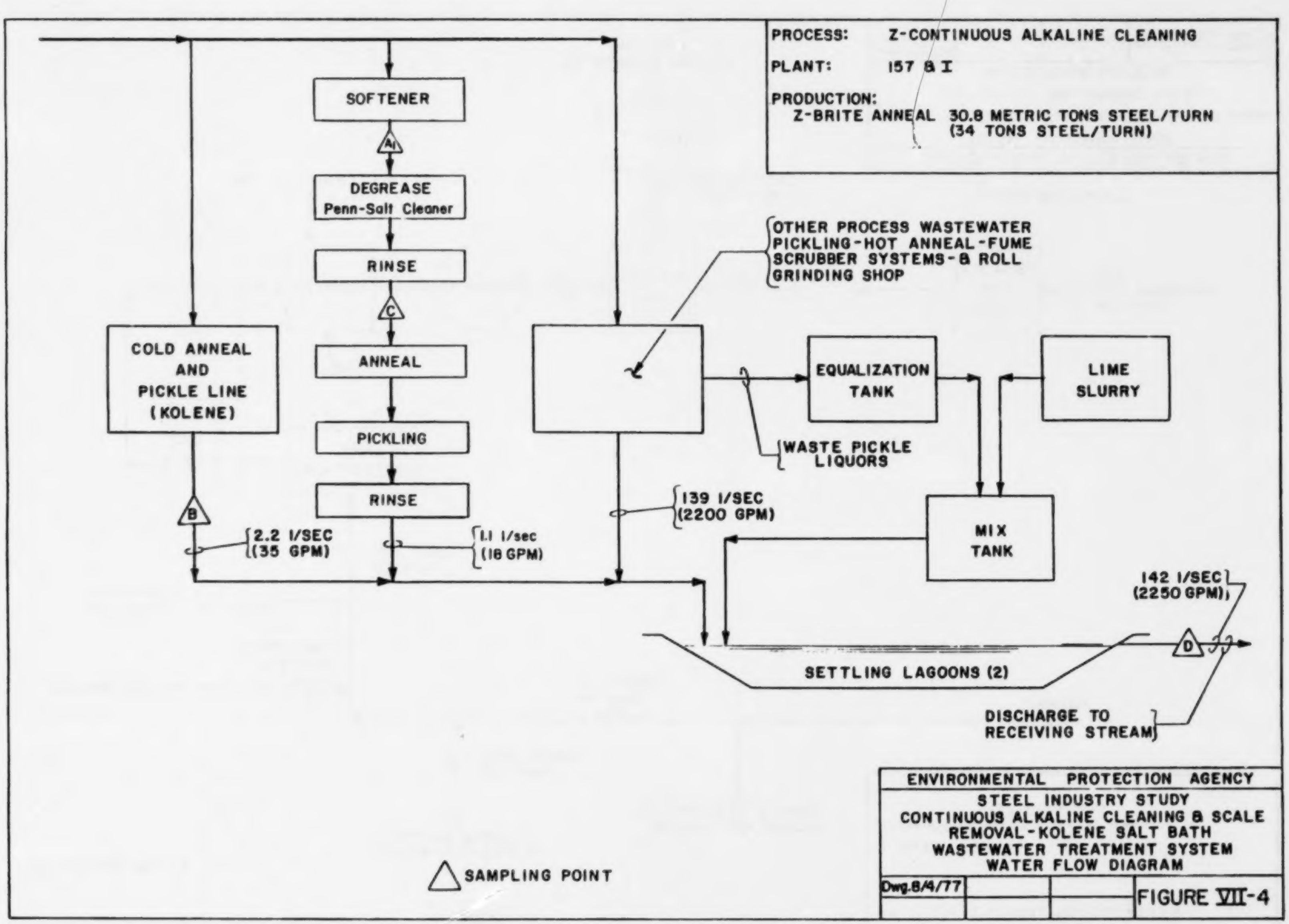

PROCESS: HOT FORMING, PICKLING, SCALE REMOVAL, WIRE COATING, ALKALINE CLEANING
PLANT: 081, 122, 132, 142, 152
PRODUCTION: SAME AS FIGURE VII-1
INFLUENT
Z
TO EMERGENCY OVERFLOW LAGOON
H2SO4 ADDITION
NaOH ADDITION
EQUALIZATION & NEUTRALIZATION
COMPRESSED AIR
Clarifier Water
H2SO4 ADDITION
TREATED WATER FROM Cu/CN
NaOH ADDITION
NEUTRALIZATION & FLOCCULATION
COAGULANT/ FLOCCULATION AID
SLUDGE TO DISPOSAL
MECHANICAL CENTRIFUGE
Overflow
FLOCCULANT AID
SURGE TANK
CLARIFIER w/OIL SKIMMING
ZZ
OUTFALL
Sludge
SLUDGE CONCENTRATOR
SLUDGE TO DISPOSAL
SAMPLE POINTS
ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT FORMING, PICKING, SCALE REMOVAL, WIRE COATING, ALKALINE CLEANING
CENTRAL TREATMENT PLANT
WATER FLOW DIAGRAM
DWN.11/21/78

FIGURE VII-2



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
ACID PICKLING, GALVANIZING, ALKALINE CLEANING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-3



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
CONTINUOUS ALKALINE CLEANING & SCALE REMOVAL-KOLENE SALT BATH WASTEWATER TREATMENT SYSTEM WATER FLOW DIAGRAM

FIGURE VII-4

ALKALINE CLEANING SUBCATEGORY

SECTION VIII

COST, ENERGY, AND NONWATER QUALITY IMPACTS

Introduction

This section presents the incremental costs incurred in applying the different levels of pollution control technology to the alkaline cleaning subcategory. The analysis also describes energy requirements, nonwater quality impacts, and the techniques, magnitude and costs associated with the application of proposed limitations and standards.

Actual Costs Incurred by the Operations Sampled for This Study

The water pollution control costs reported by the industry for operations sampled during this study and for the operations for which D-DCP responses were received are presented in Table VIII-1. The costs were updated to July 1978 dollars from the data supplied by the plants at the time of sampling or from data supplied in D-DCP responses. In these tables, standard costs of capital and depreciation percentages were used so that these basic costs would be comparable. Also, where central treatment systems were present the industry often supplied total cost data for the entire treatment system. The Agency analyzed these costs and estimated that proportion attributable to alkaline cleaning operations as accurately as possible. Accordingly, only those costs due to the treatment of the alkaline cleaning wastes are listed.

Because of the extensive use of central treatment for alkaline cleaning wastewaters, the Agency could not directly verify its model-based cost estimates for separate treatment of alkaline cleaning wastewaters with cost data reported by the industry for central treatment systems. However, the Agency did compare its model-based separate treatment costs with industry costs for several central treatment systems by summing the model-based separate treatment costs for each subcategory included in the existing central treatment systems. The results of this comparison presented in Volume I demonstrate that the Agency's costing methodology accurately reflects industry costs for central treatment facilities in general, and for those systems including alkaline cleaning wastewaters in particular. In fact, as shown by the data presented in Volume I, the Agency's cost estimates for separate treatment for finishing operation wastewaters are likely to be significantly higher than actual costs to be incurred by industry for central treatment.

The treatment system components considered for BPT are presented in Table VIII-2. The technologies described therein represent treatment alternatives either in use or available to alkaline cleaning operators. In addition to listing the treatment methods available, these tables also describe for each method:

1. Status and reliability
2. Problems and limitations
3. Implementation time
4. Land requirements
5. Environmental impacts other than water
6. Solid waste generation

Cost, Energy, and Nonwater Quality Impacts

General Introduction

The installation of the BPT, BAT, BCT, NSPS, and Pretreatment alternative treatment systems involve additional expenditures of money and energy. In addition, the Agency considered the effect those systems will have on air pollution, water consumption, and solid waste disposal. The Agency estimated the cost and energy requirements based upon the treatment models developed in Sections IX through XIII. These estimates are presented in this section.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve the Proposed BPT Limitations

Based upon the status of the industry as of January 1978, the Agency estimates that the industry will need to spend $7.1 million (capital cost) to upgrade existing water pollution control facilities in the alkaline cleaning subcategory to achieve the proposed BPT limitations. The total capital cost of BPT is about $13.6 million. Additionally, about $4.2 million of annual expenditures are required.

To develop the above costs, the Agency developed model plants based upon average plant sizes at the proposed flow rates. The model BPT treatment costs are presented in Tables VIII-3 and VIII-4 for batch and continuous operations, respectively. Plant by plant capital cost estimates were then made by factoring plant production to the model plant size by the "six-tenth" rule. A summary of the capital cost for each plant to achieve the BPT level of treatment is presented in Tables VIII-5 and VIII-6 for batch and continuous operations. This method yielded a cost estimate for the subcategory which the Agency believes is representative of the actual costs which the industry will bear. The cost comparisons presented in Volume I verify the accuracy of this costing methodology. Because the DCP responses listed the treatment components already installed in the subcategory, the Agency was able to separate the cost of "in-place" components from the total estimated cost.

As a final note, it should be pointed out that the cost estimates for this subcategory were developed based upon the assumption that separate wastewater treatment systems would be installed at all lines. However, as pointed out earlier, all of the operations in this subcategory which have treatment systems do so in central systems. Treating wastewaters in a central system reduces costs because of economies of scale and because duplicate equipment components are not needed. Therefore, the Agency's estimates are believed to be very conservative. Actual costs for this subcategory are expected to be much less than the estimates listed above.

B. Costs Required to Achieve BAT Limitations

The Agency considered a BAT treatment system based upon recycle of the BPT effluent. The model treatment costs associated with a recycle system are presented in Tables VIII-7 and VIII-8 for batch and continuous operations, respectively. The cost of 90% recycle for the alkaline cleaning subcategory would amount to a capital investment of $5.5 million.

C. Costs Required to Achieve BCT Limitations

The Agency has also considered a BCT treatment system based upon recycle of the BPT effluent. The model treatment costs associated with a recycle system are presented in Tables VIII-9 and VIII-10 for batch and continuous operations respectively. The cost of 90% recycle for the alkaline cleaning subcategory would amount to a capital investment of $5.5 million. The results of the BCT cost test for both batch and continuous operations are listed in Table VIII-11 and VIII-12. The results of the BCT cost test indicate that the recycle system fails for both batch and continuous operations. Therefore, the proposed BCT limitations are being set at the same level as the proposed BPT limitations.

D. Costs Required to Achieve NSPS

The Agency considered one NSPS treatment system for the alkaline cleaning subcategory. This treatment system uses the best and most efficient treatment components demonstrated in the alkaline cleaning subcategory. Model costs have been developed for the model NSPS treatment system and are shown in Tables VIII-13 and VIII-14 for batch and continuous operations.

E. Costs Required to Achieve Pretreatment Regulations

The Agency is not proposing subcategory specific pretreatment standards for alkaline cleaning. Hence, there are no additional pretreatment costs.

Energy Impacts Due to the Installation of the Requisite Technology

Very little energy will be required to operate the alternative treatment systems for alkaline cleaning operations considered by the Agency. The energy use at the various levels of treatment is presented below.

A. Energy Impacts at BPT

The Agency estimated the energy expenditures for the proposed BPT limitations based upon the assumption that all alkaline cleaning operations will install treatment systems similar to the model and that the operations will have discharge flows comparable to the model BPT flows. The Agency estimates that the BPT treatment systems for all alkaline cleaning operations will use approximately 3.0 million kilowatt-hours of electrical energy. This is less than 0.01% of the 57 billion kilowatt-hours used by the steel industry in 1978.

B. Energy Impacts at BAT

Additional energy will be required due to the installation of the BAT model treatment system. The annual costs and the electricity required for the model size treatment system are shown below.

	Energy (kw)	Annual Cost ($)
Batch Operations	5.3	800
Continuous Operations	1.3	200

C. Energy Impacts at BCT

Additional energy will be required due to the installation of the BCT model treatment model system. The annual costs and the electricity required for the model size treatment system are shown below.

	Energy (kw)	Annual Cost ($)
Batch Operations	5.3	800
Continuous Operations	1.3	200

D. Energy Impacts at NSPS

The energy required to achieve the proposed NSPS and the annual costs for that electricity are shown below for the model sized plants.

	Energy (kw)	Annual Cost ($)
Batch Operations	3.3	500
Continuous Operations	20.7	3,100

Nonwater Quality Impacts

In general, there are minimal nonwater quality impacts associated with the model treatment systems. Three impacts were analyzed: air pollution, solid waste disposal, and water consumption. The analysis conducted for the alkaline cleaning subcategory found that no significant nonwater quality impacts will result from the installation of the treatment systems under consideration.

A. Air Pollution

There are no significant impacts associated with any of the treatment components being considered in the alkaline cleaning subcategory.

B. Solid Waste Disposal

Sedimentation of the alkaline cleaning wastewaters will result in the generation of a moderate amount of sludge. The amount of solid waste (assuming dry solids) generated in the BPT model treatment system is listed below for each type of alkaline cleaning operation.

	Solid Wastes Generated at BPT (Tons/Year)
Batch Operations	110
Continuous Operations	1,365

These sludges contain primarily settled solid material. However, they also contain small amounts of toxic metals. These solid wastes must be properly disposed of in a landfill as it is unlikely that these wastes can be reused elsewhere at the plant. As the wastes are presently collected in central treatment and disposed of, the Agency believes the solid waste impacts associated with this proposed regulation are reasonable and justified.

The impacts due to the installation of the BCT model treatment system will be minimal. Recycle treatment systems mainly reduce flow and generate little or no solid waste.

There will be minimal impacts due to solid waste disposal at the NSPS level of treatment due to the small number of operations expected to install these technologies.

C. Water Consumption

Because none of the treatment systems considered for alkaline cleaning operations by the Agency employ cooling systems, little or no water consumption is anticipated due to the installation of the model treatment systems. Therefore, this impact did not affect the selection of model treatment system or the development of the proposed effluent limitations and standards.

Summary of Impacts

The Agency concludes the effluent reduction benefits described below for the alkaline cleaning subcategory justify any adverse impacts associated with energy consumption, air pollution, solid waste disposal, or water consumption.

	Effluent Loadings (Tons/Year)		
	Raw Waste	Proposed BPT	Possible BAT and BCT
Flow, MGD	2.9	2.9	0.29
Suspended Solids	1,521	76	7.6
Oil & Grease	60.8	30	3.0
Toxic Metals	0.8	0.8	0.08
Toxic Organics	0.2	0.2	0.02

TABLE VIII-1

EFFLUENT TREATMENT COSTS
ALKALINE CLEANING SUBCATEGORY

(All costs are expressed in July, 1978 dollars)

Plant Code:	152*	156*	157*	-
Reference Code:	0176-01	0112I-04	0432K	240B(01-04)
Initial Investment Cost	17,996	5,627	7,484	610,573
Annual Costs				
Cost of Capital	774	242	322	26,255
Depreciation	1,800	563	748	61,057
Operation and Maintenance	3,493	255	508	63,233
Energy, Power, Chemicals, etc.	206	10.5	NA	11,007
Other	-	16	-	5,714
TOTAL	6,273	1,087	1,578	167,266
$/Ton	2.00	0.21	0.05	**

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* Estimated costs attributable to this subcategory. Costs were apportioned on the basis of flow.

** This company has claimed its production as confidential information

NOTE: Cost of Capital is based on the formula, Initial Investment x 0.043.
Depreciation Cost is based on the formula, Initial Investment x 0.10.

TABLE VIII-2

CONTROL AND TREATMENT TECHNOLOGIES ALKALINE CLEANING SUBCATEGORY

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Equalization Tank with Oil Skimmer	Practiced at a few mills in this subcategory. Effective in equalizing flow and batch dumps.	Removes primarily floating oils	3 months	15'x15' (batch) 20'x20' (continuous)	None	Oil sludge that is collected must be incinerated or disposed of in a landfill.
B. Acid Neutralization - Add acid to the effluent from Step A in a mixing tank to reduce the pH to (6-9).	Practiced at numerous mills in this subcategory. Has proven to be an effective way to reduce the pH of alkaline wastes.	Increased cost unless source of acid exists at the plant.	6 months	25'x25'	None	None
C. Polymer Addition - In the same mixing tank as in Step B, add polymer to promote settling.	Widely practiced at mills in this subcategory. Reliable method of promoting settling.	Increased chemical costs.	6 months	No additional space necessary.	None	No significant amounts of sludges generated.
D. Clarifier - Used to remove flocculated settleable solids from Step C.	Practiced at a majority of the mills in this subcategory. Achieves more stable effluent than numerous other sedimentation devices.	Needs considerable maintenance.	15-18 months	20'x20' (batch) 36'x36' (continuous)	Can collect up to 15 tons/day of wet sludge.	Sludges generated must be disposed of in a landfill. The sludges may contain small amounts of toxic metals.

TABLE VIII-2
CONTROL AND TREATMENT TECHNOLOGIES
ALKALINE CLEANING SUBCATEGORY
PAGE 2

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
E. Vacuum Filter - To dewater underflow from Step D.	Practiced at many mills in this subcategory.	Increased capital and operating costs.	15-18 months	10'x10' (batch) 20'x20' (continuous)	Dewatered sludges require disposal.	Solids that are produced in the vacuum filter must be disposed of in a landfill. The sludges contain primarily solids but small amounts of toxic metals may be present.
F. Recycle - Returns a portion of the flow from Step D back to the alkaline cleaning process and in turn, reduces the effluent flow (Step F considered as a BAT and BCT alternative).	Practiced at a few mills in this subcategory and extensively throughout the steel industry.	The potential exists for scaling and plugging due to increased dissolved solids associated with recycle systems.	12-15 months	20'x30' (batch and continuous)	None	None
G. Filtration - To further reduce levels of solids, oils and some metallic compounds in flow from Step D. (Step G used only in NSPS systems).	Used at several mills in this subcategory and extensively in the steel industry. Reliable method to reduce the levels of solids, oils and some metallic compounds.	Increased capital and operating costs.	15-18 months	25'x25' (batch and) continuous)	Some solid wastes can be generated.	Some additional sludges are generated when the filters are backwashed.

TABLE VIII-3

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Alkaline Cleaning	Model Size-TPD :	150
:	Carbon and Specialty	Oper. Days/Year:	250
:	Batch	Turns/Day :	2

C&TT Step	A	B	C	D(3)	E(3)	Total
Investment \$ x 10^{-3}	31	41	42	47	50	211
Annual Costs \$ x 10^{-3}						
Capital	1.3	1.8	1.8	2.0	2.1	9.0
Depreciation	3.1	4.1	4.2	4.7	5.0	21.1
Operation & Maintenance	1.1	1.4	1.5	1.6	1.7	7.3
Energy and Power(1)	0.1	0.1	0.1	0.1	0.1	0.5
Chemical Costs	-	0.1	0.1	-	-	0.2
Sludge Disposal	-	-	-	-	0.1	0.1
TOTAL	5.6	7.5	7.7	8.4	9.0	38.2

	Effluent Quality(2)	Raw Waste Level	Treated Effluent Level
	Flow, gal/ton	50	50
	Suspended Solids	500	25
	Oil & Grease	20	10
	Dissolved Iron	0.50	0.50
	pH, Units	9-12	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.010
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.20

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.
(3) Treatment components are used in tandem.

KEY TO C&TT STEPS

A: Equalization tank with oil skimmer
B: Acid Neutralization
C: Polymer Addition
D: Clarifier
E: Vacuum Filter

TABLE VIII-4

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Alkaline Cleaning	Model Size-TPD :	1500
:	Carbon & Specialty	Oper. Days/Year:	250
:	Continuous	Turns/Day :	2

C&TT Step	A	B	C	D(3)	E(3)	Total
Investment \$ x 10^{-3}	56	56	72	127	145	456
Annual Costs \$ x 10^{-3}						
Capital	2.4	2.4	3.1	5.4	6.2	19.5
Depreciation	5.6	5.6	7.2	12.7	14.5	45.6
Operation & Maintenance	2.0	2.0	2.5	4.4	5.1	16.0
Energy & Power(1)	0.1	0.2	0.3	0.2	0.9	1.7
Chemical Costs	-	0.4	0.6	-	-	1.0
Sludge Disposal	-	-	-	-	0.6	0.6
TOTAL	10.1	10.6	13.7	22.7	27.3	84.4

	Effluent Quality(2)	Raw Waste Level	Treated Effluent Level
	Flow, gal/ton	50	50
	Suspended Solids	500	25
	Dissolved Iron	0.50	0.50
	Oil & Grease	20	10
	pH	9-12	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.015
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.20

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.
(3) Treatment components are used in tandem.

KEY TO C&TT STEPS

A:	Equalization tank with oil skimmer	D:	Clarifier
B:	Acid Neutralization	E:	Vacuum Filter
C:	Polymer Addition		

TABLE VIII-5

BPT CAPITAL COST TABULATION

Subcategory: Alkaline Cleaning
: Carbon & Specialty
: Batch

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place of 1/1/78

Plant Code	TPD	C&TT Step A	B	C	D	E	In Place	Required	Total
0060N	10	6	8	8	9	10	14	27	41
0068	40	14	19	19	21	23	0	96	96
0112C	NA	-	-	-	-	-	-	-	-
0112F	2	2	3	3	4	4	0	16	16
0112I	354	52	69	70	79	84	200	154	354
0240B	399	56	74	76	85	90	215	166	381
0240C	102	25	33	33	37	40	0	168	168
0248C	13	7	9	10	11	12	42	7	49
0384A	858	88	117	120	134	142	342	259	601
0460D	55	17	22	23	26	27	98	17	115
0460O	19	9	12	12	14	14	26	35	61
0460H	42	14	19	20	22	23	0	98	98
0476A	NA	-	-	-	-	-	-	-	-
0492A	474	62	82	84	94	100	0	422	422
0548	23	10	13	14	15	16	42	26	68
0548A	15	8	10	11	12	13	22	32	54
0548B	56	17	23	23	26	28	0	117	117
0580A	4	4	5	5	5	6	5	20	25
0580G	12	7	9	9	10	11	0	46	46
0636	NA	-	-	-	-	-	-	-	-
0728	75	20	27	28	31	33	0	139	139
0776O	NA	-	-	-	-	-	-	-	-
0856N	3	3	4	4	4	5	0	20	20
0856Q	35	13	17	18	20	21	33	56	89
0916A	NA	-	-	-	-	-	-	-	-
							*1039	*1921	*2960

TABLE VIII-5
BPT CAPITAL COST TABULATION
PAGE 2

NA: Not Available
*: Totals do not include confidential plants.

NOTE: Underlined costs represent facilities in place.

KEY TO C&TT STEPS

A: Equalization, with Oil Skimmer
B: Acid Neutralization
C: Polymer Addition
D: Clarifier
E: Vacuum Filter

TABLE VIII-6

BPT CAPITAL COST TABULATION

Subcategory: Alkaline Cleaning
: Carbon & Specialty
: Continuous

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place of 1/1/78

C&TT Step

Plant Code	TPD	A	B	C	D	E	In Place	Required	Total
0060D	345	23	23	30	53	60	83	106	189
0068	104	11	11	15	26	29	0	92	92
0112A	5790	126	126	162	286	326	1026	0	1026
0112D	2770	81	81	104	184	210	450	210	660
0112I	77	9	9	12	21	24	18	57	75
0176	73	9	9	12	21	24	66	9	75
0256D	89	10	10	13	23	27	0	83	83
0432A	2200	70	70	91	160	182	573	0	573
0432K	95	11	11	14	24	28	35	53	88
0448A	2565	77	77	99	175	200	175	453	628
0528	93	11	11	14	24	27	22	65	87
0580	61	8	8	11	19	21	19	48	67
0580A	4	1.6	1.6	2.1	3.6	4.1	1.6	11	13
0580B	45	6.8	6.8	8.9	15	18	0	56	56
0580D	45	6.8	6.8	8.9	15	18	31	25	56
0580E	30	5.4	5.4	6.9	12	14	5.4	38	43
0580G	12	3.1	3.1	4.0	7.0	8.0	0	25	25
0584E	1005	44	44	57	100	114	245	114	359
0584F	4754	112	112	144	254	290	0	912	912
0684C	1011	44	44	57	100	114	44	315	359
0760	65	8.5	8.5	11	19	22	0	69	69
0856D	2901	83	83	107	189	215	190	487	677
0856E	578	32	32	41	72	82	0	259	259
0856F	882	41	41	52	92	105	226	105	331
0856Q	38	6.2	6.2	7.9	14	16	20	30	50

TABLE VIII-6
BPT CAPITAL COST TABULATION
PAGE 2

Plant Code	TPD	A	B	C	D	E	In Place	Required	Total
0860B	7292	$\underline{145}$	$\underline{145}$	$\underline{186}$	$\underline{328}$	374	804	374	1178
0864B	4239	$\underline{104}$	$\underline{104}$	$\underline{134}$	$\underline{237}$	270	579	270	849
0868A	4052	102	$\underline{102}$	$\underline{131}$	$\underline{231}$	263	464	365	829
0920G	2125	69	$\underline{69}$	$\underline{89}$	$\underline{157}$	179	315	248	563
0920L	243	19	$\underline{19}$	$\underline{24}$	$\underline{43}$	49	86	68	154
09200	240	$\underline{19}$	$\underline{19}$	24	42	48	38	114	152
0948F	82	9.8	9.8	13	22	25	0	80	80
							*5516	*5141	*10,657

*: Totals do not include confidential plants.
NOTE: Underlined costs represent facilities in place.

KEY TO C&TT STEPS

A: Equalization Tank with Oil Skimmer
B: Acid Neutralization
C: Polymer Addition
D: Clarifier
E: Vacuum Filter

TABLE VIII-7

BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
: Carbon & Specialty
: Batch

Model Size-TPD : 150
Oper. Days/Year: 250
Turns/Day : 2

C&TT Step	F	Total
Investment $\$ \times 10^{-3}$	45.8	45.8
Annual Costs $\$ \times 10^{-3}$		
Capital	2.0	2.0
Depreciation	4.6	4.6
Operation & Maintenance	1.6	1.6
Energy & Power (1)	0.8	0.8
Chemical Costs	-	-
Sludge Disposal	-	-
TOTAL	9.0	9.0

	Effluent Quality (2)	BAT Feed Level	BAT Effluent Level
	Flow, gal/ton	50	5
	Suspended Solids	25	25
	Oil & Grease	10	10
	Dissolved Iron	0.50	0.50
	pH, units	6-9	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.015
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.20

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.

KEYS TO C&TT STEPS

F: Recycle

TABLE VIII-8

BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Alkaline Cleaning	Model Size-TPD :	1500
:	Carbon & Specialty	Oper. Days/Year:	250
:	Continuous	Turns/Day :	2

C&TT Step	F	Total
Investment $\$x10^{-3}$	114.8	114.8
Annual Costs $\$x10^{-3}$		
Capital	4.9	4.9
Depreciation	11.5	11.5
Operation & Maintenance	4.0	4.0
Energy & Power (1)	0.2	0.2
Chemical Costs	-	-
Sludge Disposal	-	-
TOTAL	20.6	20.6

	Effluent Quality (2)	BAT Feed Level	BAT Effluent Level
	Flow, gal/ton	50	5
	Suspended Solids	25	25
	Oil & Grease	10	10
	Dissolved Iron	0.50	0.50
	pH, units	6-9	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.015
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.20

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.

KEYS TO C&TT STEPS

F: Recycle

TABLE VIII-9

CONSIDERED BCT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
: Carbon & Specialty
: Batch

Model Size-TPD : 150
Oper. Days/Year: 250
Turns/Day : 2

C&TT Step	F	Total
Investment $\$x10^{-3}$	45.8	45.8
Annual Costs $\$x10^{-3}$		
Capital	2.0	2.0
Depreciation	4.6	4.6
Operation & Maintenance	1.6	1.6
Energy & Power (1)	0.8	0.8
Chemical Costs	-	-
Sludge Disposal	-	-
TOTAL	9.0	9.0

	Effluent Quality (2)	BCT Feed Level	BCT Effluent Level
	Flow, gal/ton	50	5
	Suspended Solids	25	25
	Oil & Grease	10	10
	Dissolved Iron	0.50	0.50
	pH, units	6-9	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.015
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.20

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.

KEYS TO C&TT STEPS

F: Recycle

TABLE VIII-10

CONSIDERED BCT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Alkaline Cleaning	Model Size-TPD :	1500
:	Carbon & Specialty	Oper. Days/Year:	250
:	Continuous	Turns/Day :	2

C&TT Step	F	Total
Investment $\$x10^{-3}$	114.8	114.8
Annual Costs $\$x10^{-3}$		
Capital	4.9	4.9
Depreciation	11.5	11.5
Operation & Maintenance	4.0	4.0
Energy & Power(1)	0.2	0.2
Chemical Costs	-	-
Sludge Disposal	-	-
TOTAL	20.6	20.6

Effluent Quality (2)	BCT Feed Level	BCT Effluent Level
Flow, gal/ton	50	5
Suspended Solids	25	25
Oil & Grease	10	10
Dissolved Iron	0.50	0.50
pH, units	6-9	6-9
36 2,6-Dinitrotoluene	0.020	0.020
39 Fluoranthene	0.015	0.015
84 Pyrene	0.010	0.010
114 Antimony	0.015	0.015
121 Cyanide	0.010	0.010
122 Lead	0.020	0.020
125 Selenium	0.015	0.015
128 Zinc	0.20	0.20

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(1) Costs are all power unless otherwise noted.
(2) All values are in mg/l unless otherwise noted.

KEYS TO C&TT STEPS

F: Recycle

TABLE VIII-11

RESULTS OF THE BCT COST TEST
ALKALINE CLEANING SUBCATEGORY

BATCH OPERATIONS

A. BCT Feed

Effluent concentration of conventional pollutants = 35mg/l
Flow = 0.0075 MGD
Days/Year = 250
lbs/year of conventional pollutants discharged = 547

B. BCT Alternative

Effluent concentration of conventional pollutants = 35mg/l
Flow = 0.00075
Days/Year = 250
lbs/year of conventional pollutants discharged = 55
lbs/year of conventional pollutants removed via BCT treatment
(BCT Feed - BCT Alternative) = 547 - 55 = 492
Annual Cost of BCT = $9,000

$/lb = 9000/492 = 18.3 FAILS

TABLE VIII-12

RESULTS OF THE BCT COST TEST
ALKALINE CLEANING SUBCATEGORY

CONTINUOUS OPERATIONS

A. BCT Feed

Effluent concentration of conventional pollutants = 35mg/l
Flow = 0.075 MGD
Days/year = 250
lbs/year of conventional pollutants discharged = 5473

B. BCT Alternative

Effluent concentration of conventional pollutant = 35mg/l
Flow = 0.0075 MGD
Days/year = 250
lbs/year of conventional pollutants discharged = 547
lbs/year of conventional pollutants removed via BCT treatment
(BCT Feed - BCT Alternative) = 5473 - 547 = 4926
Annual Cost of BCT = $20,600

$/lb = 20600/4926 = 4.2 FAILS

TABLE VIII-13

NSPS MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Alkaline Cleaning	Model Size-TPD :	150
:	Carbon & Specialty	Oper. Days/Year:	250
:	Batch	Turns/Day :	2

C&TT Steps	A	B	C	D(2)	E(2)	G	Total
Investment $ x 10^{-3}	31	41	55	7	50	53	237
Annual Cost $ x 10^{-3}							
Capital	1.3	1.8	2.4	0.3	2.1	2.3	10.2
Depreciation	3.1	4.1	5.5	0.7	5.0	5.3	23.7
Operation & Maintenance	1.1	1.4	1.9	0.3	1.7	1.8	8.3
Energy & Power(1)	0.1	0.1	0.1	-	0.1	0.1	0.5
Chemical Costs	-	0.1	0.1	-	-	-	0.2
Sludge Disposal	-	-	-	-	0.2	-	0.2
TOTAL	5.6	7.5	10.0	1.3	9.1	9.5	43.1

	Effluent Quality(3)	NSPS Feed Level	NSPS Effluent Level
	Flow, gal/ton	50	50
	Suspended Solids	500	15
	Oil & Grease	20	5.0
	Dissolved Iron	0.50	0.50
	pH, Units	9-12	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.015
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.10

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(1) Costs are all power unless otherwise noted.
(2) Treatment components are used in tandem.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Equalization tank with oil skimmer
B: Acid Neutralization
C: Polymer Addition
D: Settling Basin
E: Vacuum Filter
G: Filtration

TABLE VIII-14

NSPS MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Alkaline Cleaning
: Carbon & Specialty
: Continuous

Model Size-TPD : 1500
Oper. Days/Year: 250
Turns/Day : 2

C&TT Steps	A	B	C	D(2)	E(2)	G	Total
Investment $ x 10^{-3}	56	56	72	35	145	189	553
Annual Cost $ x 10^{-3}							
Capital	2.4	2.4	3.1	1.5	6.2	8.1	23.7
Depreciation	5.6	5.6	7.2	3.5	14.5	18.9	55.3
Operation & Maintenance	2.0	2.0	2.5	1.2	5.1	6.6	19.4
Energy & Power(1)	0.1	0.2	0.3	-	0.9	1.6	3.1
Chemical Costs	-	0.4	0.6	-	-	-	1.0
Sludge Disposal	-	-	-	-	0.6	-	0.6
TOTAL	10.1	10.6	13.7	6.2	27.3	35.2	103.1

	Effluent Quality(3)	NSPS Feed Level	NSPS Effluent Level
	Flow, gal/ton	50	50
	Suspended Solids	500	15
	Oil & Grease	20	5.0
	Dissolved Iron	0.50	0.50
	pH, Units	9-12	6-9
36	2,6-Dinitrotoluene	0.020	0.020
39	Fluoranthene	0.015	0.015
84	Pyrene	0.010	0.010
114	Antimony	0.015	0.015
121	Cyanide	0.010	0.010
122	Lead	0.020	0.020
125	Selenium	0.015	0.015
128	Zinc	0.20	0.10

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(1) Costs are all power unless otherwise noted.
(2) Treatment components are used in tandem.
(3) All values are in mg/l unless otherwise noted.

KEY TO C&TT STEPS

A: Equalization tank with oil skimmer
B: Acid Neutralization
C: Polymer Addition
D: Settling Basin
E: Vacuum Filter
G: Filtration

ALKALINE CLEANING SUBCATEGORY

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE

Introduction

The Best Practicable Control Technology Currently Available (BPT) limitations were originally promulgated in March 1976.[1] Since that time, the Agency has further studied alkaline cleaning operations and believes that the originally promulgated limitations are substantiated. Two of the sampled plants have demonstrated the ability to achieve the previous limitations. Dissolved iron, dissolved nickel, and dissolved chromium were originally limited at BPT. During the toxic pollutant survey, the Agency did not find these pollutants at treatable levels aside from recycle of wastewaters. Accordingly, the Agency is not proposing limitations for those pollutants. A review of the treatment processes and proposed effluent limitations for the alkaline cleaning subcategory follows.

Identification of BPT

The BPT model treatment system for the originally promulgated limitations employed the following wastewater treatment steps: equalization; oil skimming; neutralization with acid; addition of a polymer followed by sedimentation in a flocculation-clarifier. The sludges generated in this system are dewatered in vacuum filters. The Agency believes that this treatment system is still appropriate as the model treatment system for the proposed BPT limitations. Figure IX-1 depicts the above mentioned treatment system. The proposed BPT limitations do not require the installation of the model treatment system; any treatment system which achieves the proposed limitations is acceptable.

The proposed BPT limitations, which represent 30-day average values, are presented below.

	kg/kkg (lbs/1000 lbs) of Product
Total Suspended Solids	0.0052
pH (Units)	6.0-9.0

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[1] EPA 440/1-76/048-b, Development Document for Interim Final Effluent Limitations Guidelines and Proposed New Source Performance Standards for the Forming, Finishing and Specialty Steel Segment of the Iron and Steel Manufacturing Point Source Category.

The maximum daily effluent limitation for TSS is three times the average value presented above.

Rationale for BPT

Treatment System

As noted in Section VII, each of the BPT model treatment system components are in use at a number of alkaline cleaning operations.

Justification of BPT Limitations

Table IX-1 presents sampled plant effluent data which support the proposed BPT limitations. Two of the three sampled plants achieved the proposed limitations. With additional sedimentation or filtration, the other plant (157) could also meet the proposed BPT limitations.

TABLE IX-1

JUSTIFICATION OF BPT EFFLUENT LIMITATIONS ALKALINE CLEANING SUBCATEGORY*

	Effluent Limitations (kg/kkg)					
	TSS	D. Chromium	D. Iron	D. Nickel	pH	C&TT Components
Proposed BPT Effluent Limitations	0.0052	NL	NL	NL	6-9	E,SS,NA,FLP,CL,VF
Actual BPT Loads						
152(0176-01)	0.00048	Neg.	0.0000012	0.000012	7.2-7.9	E,NC,NW,FLP,CL,VF
156(01121-04)	0.00028	0.0000084	0.000013	0.0000056	7.3-7.7	E,NW,NL,T,FDS

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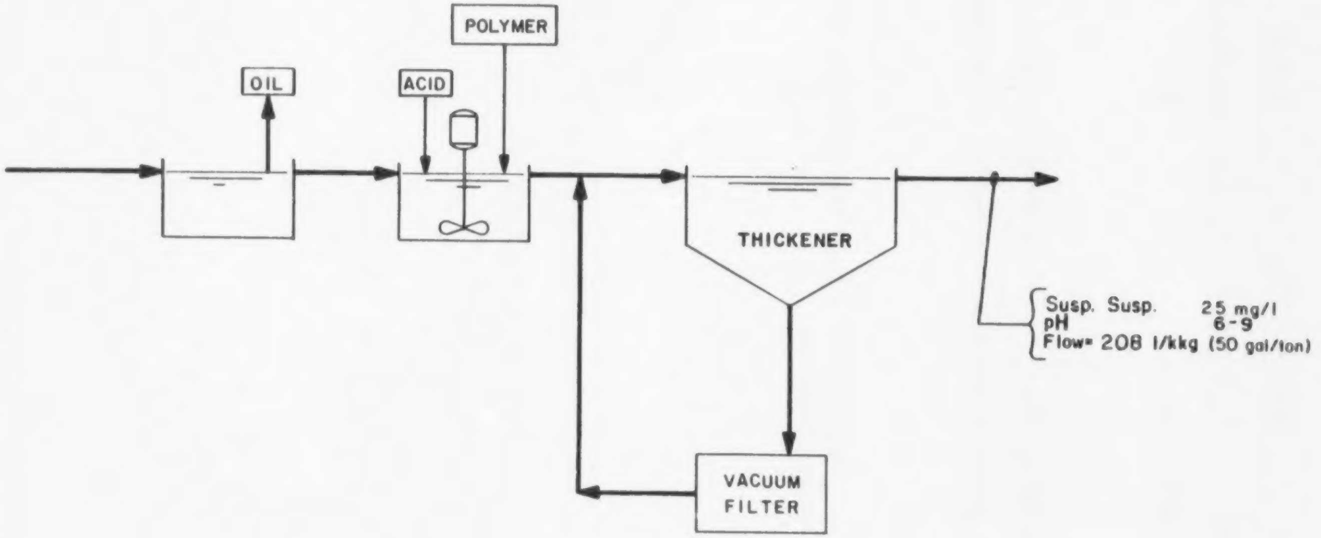
* The original BPT load was only for continuous plants. The proposed effluent limitations now apply to both batch and continuous plants.

NL : No limit is being proposed.
Neg: Less than 0.000001



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
BPT MODEL

DWN. 6/10/80

FIGURE IX-1

ALKALINE CLEANING SUBCATEGORY

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

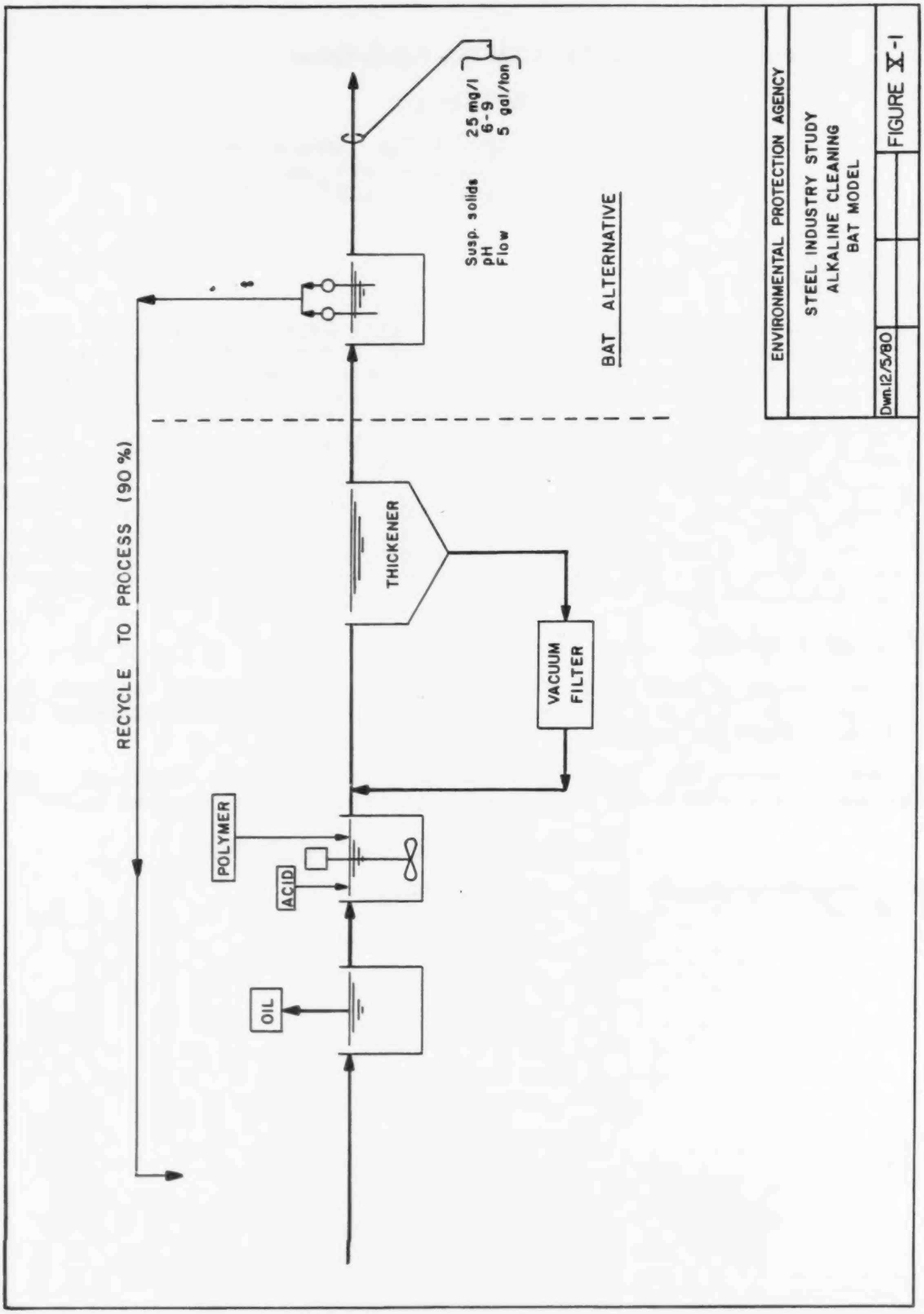
As pointed out earlier in this report, aside from recycle, the toxic metals contained in alkaline cleaning process wastewaters are not treatable. Accordingly, the Agency considered a BAT model treatment system which incorporates 90% recycle. However, because it is unaware of any discharger which recycles its wastewaters directly, the Agency is not proposing BAT limitations based on that system. The Agency believes that direct recycle or cascade rinsing of treated alkaline cleaning rinsewaters may be possible. The Agency is soliciting comments on flow reduction of the BPT effluent by recycle or other means from alkaline cleaning operations. Depending upon comments received and other information the Agency may obtain, the Agency may decide to promulgate BAT limitations based upon the model treatment system described below.

Development of BAT

The BAT model treatment system is a recycle system which reduces the BPT flow of 50 GPT to 5 GPT (90% recycle). Figure X-1 illustrates the BAT model treatment system.

The BAT limitations associated with that system, although not proposed, which represent 30-day average values are presented below.

	kg/kkg (lbs/1000 lbs) of Product
Total Suspended Solids	0.00052
pH (units)	6.0-9.0



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
BAT MODEL

FIGURE X-1

ALKALINE CLEANING SUBCATEGORY

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY (BCT)

Introduction

The 1977 Amendments added Section 301(b)(4)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(b)(4) - BOD, TSS, fecal coliform, and pH - and any additional pollutants defined by the Administrator as "conventional." On July 28, 1978, EPA proposed that COD, oil and grease, and phosphorus be added to the conventional pollutant list (43 Fed. Reg. 32857). Only oil and grease was added.

BCT is not an additional limitation, but replaces BAT for the control of conventional pollutants. BCT requires that limitations for conventional pollutants be assessed in light of a new "cost-reasonableness" test, which involves a comparison of the cost and level of reduction of conventional pollutants from the discharge of POTWs to the cost and level of reduction of such pollutants from a class or category of industrial sources. As part of its review of BAT for certain "secondary" industries, EPA proposed methodology for this cost test. (See 43 Fed. Reg. 37570, August 23, 1978).

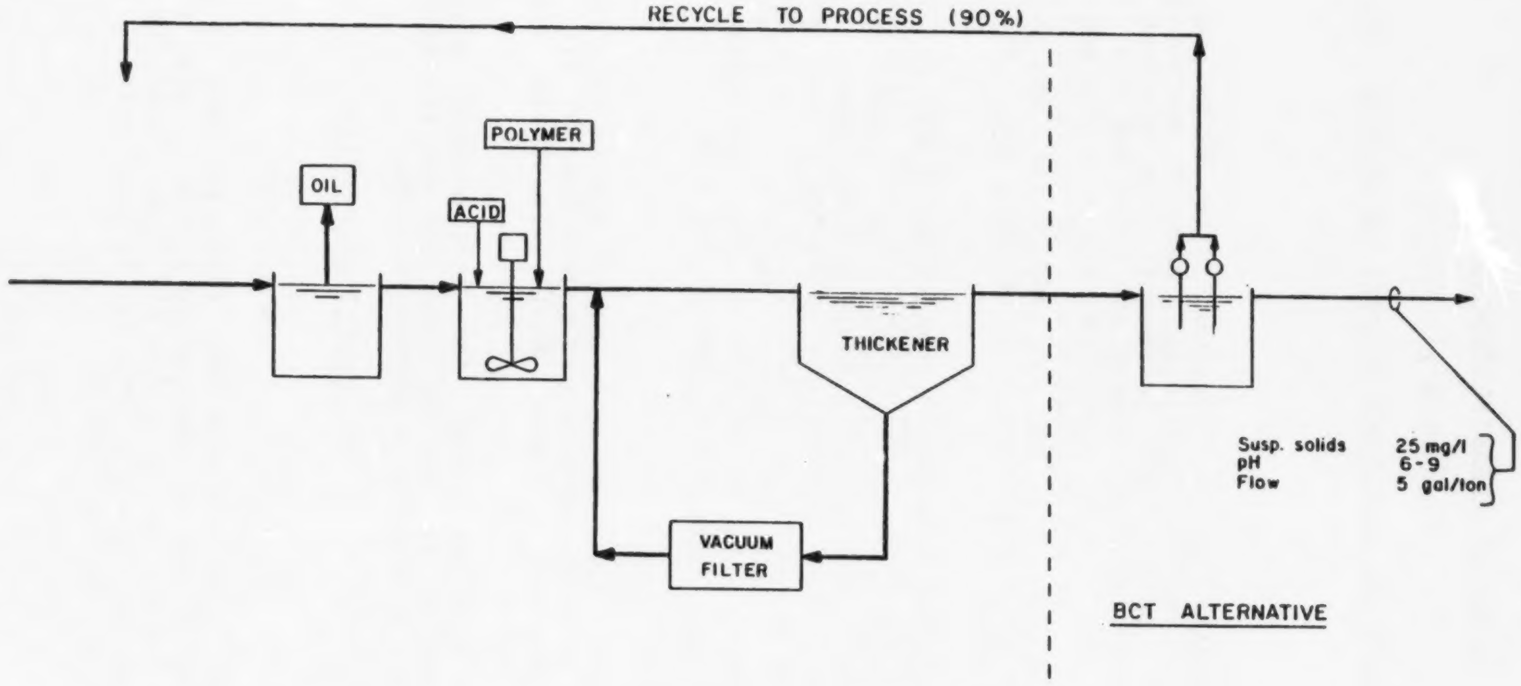
Development of BCT

The Agency is currently considering a recycle system as a possible BCT alternative. This recycle system would reduce the BPT flow of 50 GPT to 5 GPT (90% recycle). Figure XI-1 illustrates the BCT model treatment system.

The reference POTW treatment cost for conventional pollutants is $1.34/lb. The results of the BCT Cost Test are presented in Table VIII-11 and VIII-12. A summary is presented below.

Mill Type	BCT Cost Test Results
Batch	$18.30/lb
Continuous	$ 4.20/lb

As can be seen above, the reference POTW treatment cost of $1.34/lb is exceeded for both batch and continuous operations. Thus, the BCT Cost Test fails in both cases. Based on the BCT Cost Test results, the proposed BCT limitations are the same as the proposed BPT limitations for the alkaline cleaning subcategory.



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
BCT MODEL

Dwn. 9/1/79

FIGURE XI-1

ALKALINE CLEANING SUBCATEGORY

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS

Introduction

A new source is defined as any source constructed after the proposal of new source performance standards (NSPS). The degree of effluent reduction achievable through the application of the best available demonstrated control technology (BADCT), processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants. At this time, however, zero discharge is not a feasible treatment alternative for the alkaline cleaning subcategory. As discussed in Section VII, except for evaporative systems, there are no technologies which could be applied to all operations in this subcategory to attain zero discharge of process wastewater pollutants. An evaporative system is extremely costly and is not a demonstrated means of attaining zero discharge in this subcategory.

Identification of NSPS

The Agency has selected the NSPS model treatment system based on the best treatment components demonstrated in the alkaline cleaning subcategory. This system is similar to the BPT model treatment system, however, it employs filtration instead of clarification as its primary solids and metals removal component. The NSPS system treats a reduced flow in an equalization tank equipped with an oil separator. After equalization, acid and polymer are added in mixing tanks. Following chemical addition, preliminary sedimentation is carried out in a settling tank where accumulated solids can be drawn off and dried in vacuum filters. After sedimentation, filtration is carried out to further reduce the concentration of the pollutants in the effluent. This NSPS treatment system is depicted in Figure XII-1. The corresponding effluent standards for NSPS are presented in Table XII-1.

Rationale for the Selection of NSPS

The NSPS model treatment system employs those components that achieve the most significant removal of toxic and conventional pollutants at a reasonable cost. The Agency considered various other NSPS alternative treatment systems including those that achieved zero discharge. However, these systems were generally too costly. The rationale for the NSPS model treatment system selected, and the flow and effluent concentrations is set out below.

Treatment Scheme

The NSPS model treatment system employs standard chemical addition, sedimentation and filtration equipment. All proposed treatment components are well demonstrated in this and other steel industry subcategories. Equalization is used to reduce fluctuations in flow and pollutant concentrations so that subsequent treatment components will operate more effectively. Oil skimming is provided to reduce any floating oils that may be present in the wastewaters. Acid is added in a reaction tank to neutralize the pH of the incoming wastewater to within the required range of 6.0 to 9.0. The neutralization step is followed by polymer addition. Polymer is added to aid solids and metals removal. The polymer addition is carried out in a mixing tank to provide proper contact between the solids and the polymer.

After chemical addition, the wastewaters undergo preliminary settling prior to filtration. A settling basin is used in the model since this unit will reduce solids to a level which will not interfere with the filtration equipment. Clarifiers or thickeners could also be used, however, these units normally cost more. Following sedimentation the wastewater is filtered to remove the remaining particulate matter and oils. Filtration was chosen as a final step because it is demonstrated in the steel industry and because it is effective at reducing the levels of solids, oils, and metals. The filtration unit costed for this study has been a multi-media pressure filtration unit since this is the type of equipment most often used in the steel industry. However, numerous types of filtration units can effectively be used to treat alkaline cleaning wastewaters.

Flows

Batch and Continuous Operations

Proposed Flow Rate: 50 gal/ton

A model discharge flow of 50 gal/ton for both batch and continuous operations is the basis for the proposed NSPS. This flow has been demonstrated at numerous batch and continuous operations. Six batch operations (approximately 23% of the batch operations submitting flow data) and nine continuous operations (approximately 10% of the continuous operation submitting flow data) have shown the ability to achieve the model 50 gal/ton flow.

Pollutants

The Agency selected the following pollutants for which NSPS standards are being proposed: total suspended solids, oil and grease, and pH. Suspended solids is an important pollutant since solids can be generated in significant levels in the alkaline cleaning process. Oil and grease was added to the list so that any oils removed from the product in the process can be controlled. Also, oils and greases are limited in numerous Phase II operations. Therefore, the addition of oil and grease to the list of pollutants limited will facilitate the development of combined limitations for central treatment systems.

Finally, pH is limited to insure that the wastewaters are properly neutralized.

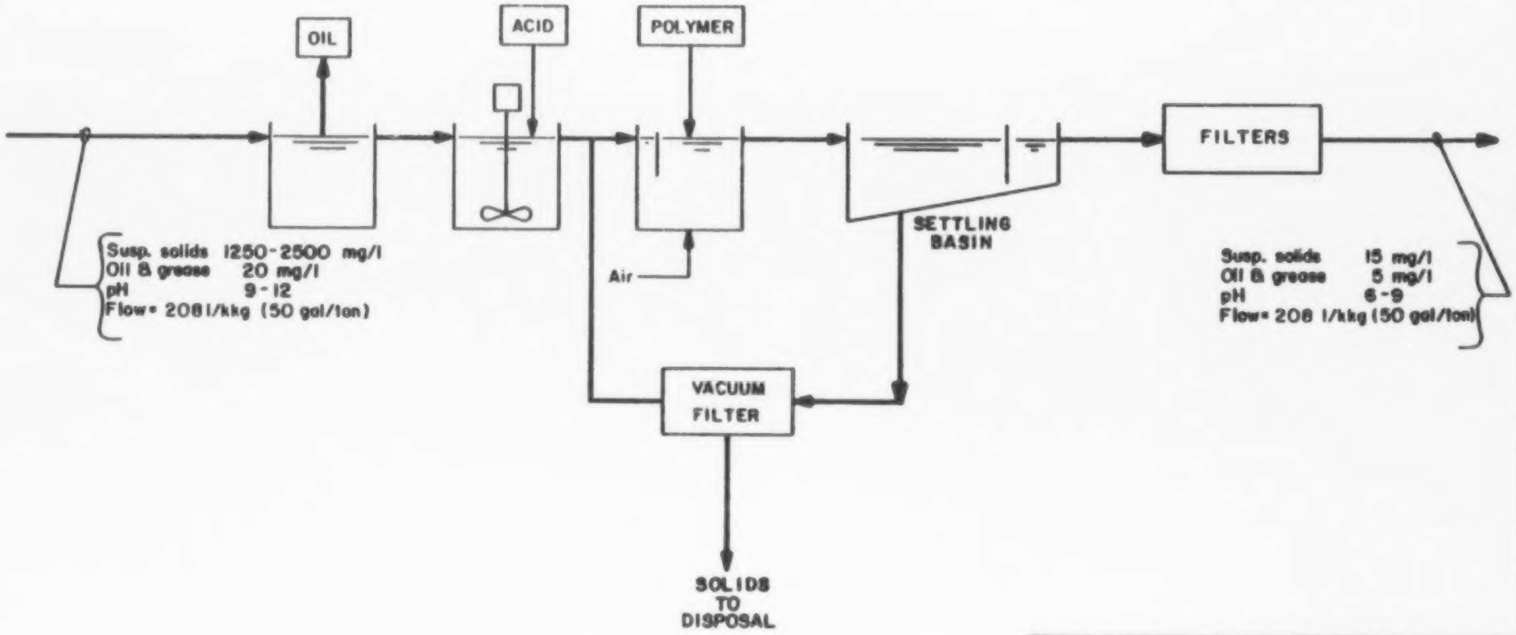
Effluent Concentrations

The proposed NSPS are set out in Table XII-1. These standards are based upon the filtration system used in the NSPS model treatment system. The rationale for selecting these levels is detailed in Volume I under the discussion of filtration systems.

TABLE XII-1

NEW SOURCE PERFORMANCE STANDARDS ALKALINE CLEANING SUBCATEGORY

		Batch & Continuous Operations	
		Concentration Basis (mg/l)	Effluent Standards (kg/kkg of Product)
Discharge Flow (Gal/Ton)			50
Total Suspended Solids	Ave.	15	0.0031
	Max.	40	0.0083
Oil & Grease	Ave.	-	-
	Max.	10	0.0021
pH, Units		Within the range of 6.0 to 9.0	



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
ALKALINE CLEANING
NSPS MODEL

Dwn. 9/1/79

FIGURE - XII - 1

ALKALINE CLEANING SUBCATEGORY

SECTION XIII

PRETREATMENT STANDARDS FOR DISCHARGES TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section discusses the alternative control and treatment systems available to alkaline cleaning operations which discharge wastewaters to publicly owned treatment works (POTWs). Separate consideration is given to pretreatment of alkaline cleaning wastewaters for new sources (PSNS) and existing sources (PSES). The Agency is not proposing treatment standards for alkaline cleaning operations. Instead, the General Pretreatment Regulations, 40 CFR Part 403, will apply. The general pretreatment and categorical pretreatment standards applying to alkaline cleaning operations are discussed below.

General Pretreatment Standards

For detailed information on Pretreatment Standards, refer to 43 FR 27736-27773, "General Pretreatment Regulations for Existing and New Sources of Pollution," (June 26, 1978). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards, and POTW pretreatment programs.

In establishing pretreatment standards for alkaline cleaning operations, the Agency gave primary consideration to the objectives and requirements of the General Pretreatment Regulations. The General Pretreatment Regulations set forth general discharge prohibitions that apply to all non-domestic users of a POTW to prevent pass-through of pollutants, interference with the operation of a POTW, and municipal sludge contamination. The regulations also establish administrative mechanisms to ensure application and enforcement of prohibited discharge limits and categorical pretreatment standards. In addition, the Regulations contain provisions relating directly to the determination of and reporting on Pretreatment Standards.

HOT COATING SUBCATEGORY

SECTION I

PREFACE

The USEPA is proposing effluent limitations guidelines and standards for the iron and steel industry. The proposed regulation contains effluent limitations guidelines for best practicable control technology currently available (BPT), best conventional pollutant control technology (BCT), and best available technology economically achievable (BAT) as well as pretreatment standards for new and existing sources (PSNS and PSES) and new source performance standards (NSPS), under Sections 301, 304, 306, 307 and 501 of the Clean Water Act.

This part of the Development Document highlights the technical aspects of EPA's study of the Hot Coating Subcategory of the Iron and Steel Industry. Volume I of the Development Document discusses issues pertaining to the industry in general, while other volumes relate to the remaining subcategories of the industry.

HOT COATING SUBCATEGORY

SECTION II

CONCLUSIONS

This subcategory report of the Development Document highlights the technical aspects of EPA's study of the Hot Coating Subcategory of the Iron and Steel Manufacturing Category. This subcategory includes the hot dipped coating operations previously designated as the Hot Coating - Galvanizing and Hot Coating - Terne subcategories, and adds another subdivision for Hot Coating - Other Metals.

Based upon this current study and a review of previous studies, the Agency has reached the following conclusions.

1. The Agency is retaining the previous subdivision of this subcategory based on differences in coating metal, and on additional process water requirements for the use of fume scrubbers. This subdivision provides for limitations of different groups of metal pollutants, and provides additional flow allowances where appropriate.

2. The originally promulgated limitations covered galvanizing and terne-coating operations only. This proposed regulation contains an additional third subdivision which proposes limitations for other metallic coatings. Metals identified as part of this subdivision include aluminum, cadmium, lead, and tin, along with combinations of these metals or combinations with zinc. As in the original two subdivisions, the proposed regulation provides additional allowances for hot coating lines which have fume hood scrubbers and for certain product requirements (see number 3 below).

3. The Agency concluded that the previously promulgated BPT limitations are appropriate for strip, sheet and miscellaneous product (plate, bars, rods, pipe, tube, architectural and structural shapes) coating lines. Accordingly, it is proposing BPT limitations which are the same as those previously promulgated. However, the Agency also found that the previous limitations are not appropriate for hot coating lines producing nails, fasteners, and wire products (wire, wire cloth, barbed wire, chain link and other fencing), because of a demonstrated need for higher rinsing and scrubbing flow rates on a gallon per ton basis. To achieve those limitations, a 70-80 percent flow reduction through recycle or cascade rinsing would be required while the strip, sheet, and miscellaneous products lines could achieve the previous limitations with once-through treatment. The proposed limitations provide additional flow allowances for certain products from galvanizing and other metal coating lines. These allowances are based on rinsewater applied rates of 2400 gallons per ton and fume hood scrubber applied rates of 1500 gallons per ton. Since all terne coating operations coat strip

and sheet, no additional allowances are necessary for that subdivision.

4. The Agency's sampling and analyses of hot coating plant wastewaters identified the presence of more than 35 toxic organic and toxic metal pollutants. However, none of the toxic organic pollutants were found at concentrations which can be effectively treated other than by flow reduction. Since the BAT model treatment systems will effectively control nearly all toxic metals, relatively few limitations are necessary to insure the desired load reductions for all. The list of pollutants for which BAT limitations are proposed is standardized for all hot coating subdivisions to include chromium, lead, and zinc. Cadmium is also limited for lines which use cadmium as a metal coating. All other toxic metals will be controlled to acceptable levels by the limitations established for these indicator pollutants. A summary of raw waste, proposed BPT and proposed BAT effluent loadings for the Hot coating subcategory follows:

	Discharge Loadings (Tons/Yr)		
	Raw Waste	Proposed BPT	Proposed BAT & BCT
Flow, MGD	34.7	34.7	7.2
TSS	2,547	1,896	233
Oil and Grease	2,037	569	77.8
Toxic Metals	3,447	335	4.6
Toxic Organics	2.3	1.2	0.1

5. Based upon facilities in place as of January 1, 1978, the Agency estimates the following costs to the industry will result from compliance with the proposed BPT and BAT limitations for the hot coating subcategory.

	Costs (Millions of July 1, 1978 Dollars)			
	Investment Costs			Annual
	Total	In Place	Required	Costs
BPT	64.1	28.2	35.9	12.8
BAT	11.1	3.9	7.2	3.3

6. The Agency evaluated the "cost-reasonableness" of controlling conventional pollutants (TSS, oils and grease, pH), and concludes that control costs based upon the BCT model treatment system are less than the costs experienced by publicly owned treatment works (POTWs) for all segments of hot coating - galvanizing subdivision, and for most of the other segments as well. For the two segments where the cost test fails (terne coating without scrubbers; other metal coating, wire products and fasteners with scrubbers), the proposed BCT limitations are the same as the proposed BPT limitations for conventional pollutants. The Agency is proposing more stringent BCT limitations for all other subdivisions based on the BCT model treatment systems.

7. Proposed NSPS for all hot coating subdivisions are equal to the proposed BAT limitations and are based upon the same model

treatment system. Flow reduction steps are incorporated at the beginning of treatment, and thus costs are reduced for the remainder of the treatment system. Data for existing plants support the proposed NSPS.

8. EPA is proposing pretreatment standards covering new and existing sources (PSNS and PSES) which discharge wastewaters to POTWs which are equal to the proposed BAT limitations. These standards are designed to minimize the impact of pollutants which would interfere with, pass through, or otherwise be incompatible with POTW operations.

9 With regard to the remand issues, the Agency found that their applicability to hot coating operations is limited to the following:

a. Impact of age on the cost and "ease of retrofit."

Age does not significantly affect either the cost or a discharger's ability to retrofit wastewater treatment systems to existing production facilities.

b. The adequacy of cost estimates, especially with respect to site-specific costs.

The Agency has found that its estimates of the cost of installing the model treatment systems are sufficiently generous to cover all but the most unusual site-specific conditions. Actual investment costs were reported for eleven different hot coating operations covering a variety of products. Plant expenditures varied between $14,310 and $2,958,000. The sum total for the ten plants which provided comparable data was $4.24 million, while EPA's estimate for those same facilities in-place was $6.64 million. Cost data for the eleventh plant could not be used since reported costs for this plant include operations other than hot coating and industrial categories other than iron and steel manufacturing. Costs provided for the plants included items generally regarded as site-specific and where applicable, included those expenditures made necessary because treatment facilities had to be retrofitted to existing production lines. Hence, the Agency concludes that its model-based cost estimates are sufficient to cover site-specific and retrofit costs for both separate and central treatment systems. For more detail on cost comparisons refer to Section VIII.

c. Water Consumption

The impact of the proposed limitations and standards for the hot coating subcategory upon water consumption is insignificant. The cascade rinsing and recycle components of the model treatment systems do not elevate the temperature of the water to the point where evaporation becomes significant.

10. Although wastewaters for more than three-fourths of all hot coating lines are treated jointly with other wastewaters in central treatment facilities, the proposed limitations and standards are achievable by either separate or central treatment. Most of the plants which were sampled and served as the basis for the Agency's conclusions regarding wastewater treatability were central treatment systems.

11. The Agency received comments from a small segment of the industry suggesting that limitations should be based on a load per surface area coated basis rather than on a load per production weight basis. Although that approach may have some merit, the Agency understands that most hot coating lines do not keep records of surface areas, and to base limitations upon that unit would result in burdensome recordkeeping for the industry as a whole. The Agency believes that any benefit to operators which might accrue from a surface area based limitation has already been provided by the proposed additional allowances for the wire products and fasteners segments of hot coating. Effluent limitations and standards are proposed on a kg of pollutants per kkg of coated metal product (lbs per 1000 lbs) basis.

12. The Agency found several hot coating plants without fume hood scrubbers that achieve no discharge. Those plants are in the following segments:

    a. Galvanizing - strip, sheet, and miscellaneous products (pipe and tube)

    b. Galvanizing - wire products and fasteners (wire)

    c. Other coatings - strip sheet, and miscellaneous products (strip).

    The Agency is soliciting comments on whether the above segments should be further subdivided, and, whether zero discharge limitations at the BAT, BCT, NSPS, PSES, and PSNS levels should be promulgated for the above product lines, based upon the demonstrated performance of plants within this subcategory. No additional costs beyond BPT will be required to achieve zero discharge.

13. Table II-1 presents the treatment model flow and effluent quality data used to develop the proposed BPT effluent limitations for the hot coating subcategory, and Table II-2 presents these proposed limitations. Table II-3 presents the treatment model flow and effluent quality data used to develop the proposed BAT and BCT effluent limitations and the proposed NSPS, PSES, and PSNS for the hot coating subcategory; Table II-4 presents these proposed limitations and standards.

TABLE II-1

BPT TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
HOT COATING SUBCATEGORY

	Pollutant	Monthly Average Concentration$^{(1)}$		
		Galvanizing	Terne Coating	Other Metal Coatings
	Flow, gal/ton:			
	Strip Sheet & Misc. Prod. - No Scrubbers	600	600	600
	Strip Sheet & Misc. Prod. - With Scrubbers	1200	1200	1200
	Wire Products & Fasteners - No Scrubbers	2400	NA	2400
	Wire Products & Fasteners - With Scrubbers	3900	NA	3900
	TSS	50	50	50
	Oil & Grease	15	15	15
118	Cadmium	-	-	0.5$^{(2)}$
119	Chromium, Total: Strip Sheet & Misc. Prod.	3.0	-	0.2
	Chromium, Total: Wire Products & Fasteners	1.0	-	0.5
	Chromium, Hexavalent	0.02	-	-
122	Lead	-	0.5	0.5
128	Zinc	5.0	-	3.0
	Tin	-	5.0	-
	pH, Units	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0

---

(1) Concentrations are expressed as mg/l unless otherwise noted. Maximum daily concentrations are three times the monthly average concentrations presented above.

(2) Only applies to operations using cadmium as the coating metal.

NA: Not Applicable. There are no terne coating lines processing wire product or fasteners.

TABLE II-2

PROPOSED BPT EFFLUENT LIMITATIONS
HOT COATING SUBCATEGORY

	Pollutant	Monthly Average Effluent Limitations(1) (kg/kkg of Coated Product) Galvanizing	Terne Coating	Other Metal Coatings
	TSS	0.125	0.125	0.125
	O&G	0.0375	0.0375	0.0375
118	Cadmium	-	-	0.00125(2)
119	Chromium, Total: Strip, Sheet & Misc. Prod.	0.0075	-	0.00050
	Chromium, Total: Wire Products & Fasteners	0.010	-	0.00500
	Chromium, Hexavalent	0.00005	-	-
122	Lead	-	0.00125	0.00125
128	Zinc	0.0125	-	0.0075
	Tin	-	0.0125	-
	pH, Units	6.0 to 9.0	6.0 to 9.0	6.0 to 9.0

---

(1) Maximum daily limitations are three times the monthly average limitations presented above. Stated limitations are basic allowances for strip, sheet and miscellaneous product coating lines which do not have fume scrubbers. For other operations, the basic limitation is multiplied by the following factors:

Operation	Factor
Strip, Sheet, & Miscellaneous Product Coating Lines with Fume Scrubbers	2.0
Wire Product & Fastener Coating Lines - No Fume Scrubbers	4.0
Wire Product & Fastener Coating Lines - With Fume Scrubbers	6.5

Note that for total chromium, basic limitation already differ according to product coated. In this case, strip, sheet & miscellaneous coating lines with scrubbers are limited to 2.0 times the basic limitation for strip, sheet & miscellaneous coating lines as above, but wire product and fastener coating lines with scrubbers are limited to 1.63 times the basic limitation for those products.

(2) Only applies to operations using cadmium as the coating metal.

TABLE II-3

TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
HOT COATING SUBCATEGORY

	Pollutant	Monthly Average Concentration(1)				
		BAT	BCT	NSPS	PSES	PSNS
	Flow, gal/ton:					
	Strip, Sheet & Misc. Prod. - No Scrubbers	150	150	150	150	150
	Strip, Sheet & Misc. Prod. - With Scrubbers	200	200	200	200	200
	Wire Products & Fasteners - No Scrubbers	600	600	600	600	600
	Wire Products & Fasteners - With Scrubbers	750	750	750	750	750
	TSS	-	15,30,50(2)	15	-	-
	Oil & Grease(4)	-	10*,15(3)	10*	-	-
118	Cadmium	0.1	-	0.1	0.1	0.1
119	Chromium, Total	0.1	-	0.1	0.1	0.1
122	Lead	0.1	-	0.1	0.1	0.1
128	Zinc	0.1	-	0.1	0.1	0.1
	pH, Units	-	6.0 to 9.0	6.0 to 9.0	-	-

---

(1) Concentrations are expressed as mg/l unless otherwise noted. Maximum daily concentrations are based upon multiplying the monthly average concentrations presented above by the following factors:

Pollutants	Factor
TSS for lines coating with other metals, but with no fume scrubbers	2.0
TSS for all galvanizing lines, and for terne and other metal strip, sheet & misc. product lines with fume scrubber	2.67
TSS and O&G for terne lines without fume scrubbers and for other metal wire product and fastener coating lines with scrubbers, and all cadmium, chromium, lead and zinc	3.0

TABLE II-3
TREATMENT MODEL FLOWS AND EFFLUENT QUALITY
HOT COATING SUBCATEGORY
PAGE 2

(2) The TSS concentration at BCT is 15 mg/l for all galvanizing, and for terne and other metal strip, sheet and misc. product lines with fume scrubbers; 30 mg/l for other metal coating lines with no fume scrubbers and 50 mg/l for terne lines no fume scrubbers and other metal wire product and fastener lines with fume scrubbers.

(3) The O&G monthly average concentration is 15 mg/l for terne lines with no scrubbers, and for other metal wire product and fastener coating lines with scrubbers. The maximum daily concentration (there is no monthly average concentration for these segments) is 10 mg/l for all galvanizing, for terne and other metal strip, sheet and misc. product coating lines with fume scrubbers, and for other metal coating lines with no fume scrubbers.

(4) Only applies to operations using cadmium as the coating metal.

*: As shown, daily maximum concentration only. No monthly average concentration applies.

TABLE II-4

PROPOSED EFFLUENT LIMITATIONS AND STANDARDS
HOT COATING SUBCATEGORY

		Monthly Average Concentration(1) (kg/kkg of Coated Product)				
	Pollutant	BAT	BCT	NSPS	PSES	PSNS
	TSS	-	938(2) 1880(3) 12500(4)	938	-	-
	Oil & Grease	-	626*(2),(3) 3750(4)	626*	-	-
118	Cadmium(5)	6.26	-	6.26	6.26	6.26
119	Chromium, Total	6.26	-	6.26	6.26	6.26
122	Lead	6.26	-	6.26	6.26	6.26
128	Zinc	6.26	-	6.26	6.26	6.26
	pH, Units	-	6.0 to 9.0	6.0 to 9.0	-	-

---

(1) Proposed limitations and standards have been multiplied by 10^5 to obtain the values presented in this table. The values shown are basic allowances for strip, sheet and miscellaneous product coating lines which do not have fume scrubbers. For other operations, the basic allowance is multiplied by the following factors:

Operation	Factor
Strip, Sheet and Miscellaneous Product Coating Lines with Fume Scrubbers	1.33
Wire Product and Fastener Coating Lines - No Fume Scrubbers	4.0
Wire Product and Fastener Coating Lines - With Fume Scrubbers	5.0

Maximum daily effluent limitations and standards are based upon multiplying the applicable monthly average limitation or standard by the following factors:

Pollutant(s)	Factor
TSS for lines coating with other metals, but with no fume scrubbers	2.0
TSS for all galvanizing lines, and for terne and other metal strip, sheet and miscellaneous product lines with fume scrubbers.	2.67
TSS and O&G for terne lines without fume scrubbers and for other metal wire product and fastener lines with scrubbers, and all cadmium, chromium, lead and zinc	3.0

TABLE II-4
PROPOSED EFFLUENT LIMITATIONS AND STANDARDS
HOT COATING SUBCATEGORY
PAGE 2

(2): For all galvanizing, and for terne and other metal strip, sheet & miscellaneous product lines with fume scrubbers.
(3): For all other metal coating lines with no fume scrubbers.
(4): For terne lines with no fume scrubbers, and for other metal wire product & fastener lines with fume scrubbers.
(5): Only applies to operations using cadmium as the coating metal.
* : As shown, daily maximum limitation or standard only. No equivalent average monthly limitation or standard applies.

HOT COATING SUBCATEGORY

SECTION III

INTRODUCTION

Background

The following discussion covers two of the subparts of the originally promulgated regulation:

Subcategory T - Hot Coating - Galvanizing
Subcategory U - Hot Coating - Terne Plating

In addition, this section discusses a third process (Hot Coating - Other Metals) for operations previously not covered by the hot coating subcategories.

The originally promulgated limitations were primarily based upon data obtained through field sampling at six hot coating facilities. This present study included field sampling at two of the same plants and five additional hot coating operations, and, in addition, an overall review of flow and wastewater treatment components used at the hot coating plants surveyed by basic data collection portfolios (DCPs). Summaries of the responses to these DCPs are shown as Table III-1 for galvanizing operations, Table III-2 for terne coating operations, and Table III-3 for hot coating operations which apply aluminum, cadmium, lead, tin or combinations of these metals with zinc. These tables identify products, coatings, ages, sizes, operating modes, applied and discharged wastewater flows, control and treatment technologies, and ultimate discharge mode for each hot coating production line for which data have been received. Ninty-eight percent of the responses contained sufficiently detailed data for use in these summaries. The remaining lines were either inactive at the time of the request, or were being phased out.

DCP responses were solicited from about five-sixths of the domestic hot coating line operators representing 97 percent of the nation's hot coating capacity. The Agency's data collection effort focused on acquiring data from the ten largest steel companies, from selected other companies known to have wastewater treatment systems in place, and, from a representitive group of the smaller operators. This approach has provided data on lines as small as 525 pounds per turn and as large as 940 tons per turn. The largest steel corporation in the country provided data for 28 hot coating lines varying in size from a 1.8 ton per turn wire coating line to a 321 ton per turn continuous strip and sheet galvanizer. The Agency is confident that the DCP responses are representative of all hot coating operations, including those plants not solicited for data. Following a review of the DCP responses, detailed data collection portfolios (D-DCPs) requesting cost data and analytical results were forwarded to nine plants, including one plant previously sampled. Overall, field sampling covered 14% of the plants with annual capacities equal to 17%

of the estimated domestic hot coating capacity. Detailed pollutant concentration and load data as well as cost data were sought from plants accounting for an additional 17% of the national production capacity, and basic data were requested for plants comprising 97% of national capacity. Table III-4 summarizes the data base for the entire hot coating subcategory.

The Agency obtained both in-process and end-of-pipe samples during the field sampling visits. Data on raw wastewater and effluent characteristics, water use and cost information supplied for individual plants from historical records were also obtained during such visits. The NPDES permit application data were of limited value for the purposes of this study since most of these data are for outfalls serving more than one operation. Moreover, formats used for permits frequently were deficient in one or more of the components needed to correlate the data (e.g., daily production rates, shift schedules for multi-line operations).

The alternative treatment systems and effluent limitations were derived, to the maximum extent possible, from available data on the actual performance of existing plants. Plants employing treatment components equivalent or similar to the BPT model treatment systems were reviewed to verify the achievability of the March 29, 1976 limitations. Additional plants were reviewed for demonstrated technologies which, together with field sampling data, provide the basis for various BAT, BCT, NSPS, PSES, and PSNS treatment systems.

Descriptions of Hot Coating Operations

Hot coating processes in the steel industry involve the immersion of clean steel into baths of molten metal for the purpose of depositing a thin layer of the metal onto the steel surfaces. The coatings provide desired qualities, such as resistance to corrosion, safety from contamination, or a decorative bright appearance. Finished products retain the strength of steel while gaining the improved surface quality of the coated metal for a fraction of the cost of products made entirely of that metal alone.

All methods for applying protective coatings to steel products require careful attention to proper surface preparation - the primary and most important step in the coating process. Without proper surface preparation, good adhesion is impossible. Surface preparation methods vary depending on the type of coating applied and on the shape of the surface being coated, but all methods aim at cleanliness and uniformity of the surface. The most common methods used are acid pickling to remove scale or rust, alkaline or solvent cleaning to remove oils and greases, and physical desurfacing with abrasives to eliminate surface imperfections.

The two major classes of metallic coating operations in the industry are hot coating and cold coating. Zinc, terne, and aluminum coatings are most often applied from molten metal baths, while tin and chromium are usually applied electrolytically from plating solutions. For details on cold coating operations, refer to the Development Document for the Electroplating Industry.

Hot Coating

Hot-dipped coating operations using baths of molten metal are practiced in the steel industry as a batch-dip operation for sheet, plate, pipe or other pre-formed products, or on a continuous basis for coiled wire or strip and sheet as the base metal source. Mill processes vary, depending on the coating being applied. Refer to Figures III-1, III-2 and III-3 for typical process flow diagrams covering galvanizing (zinc) coating operations, and to Figures III-4 and III-5, for terne coating and aluminizing process flow diagrams. Aluminum is shown as an example of other metal coating, but the diagram also applies to cadmium, lead, hot-dipped tin, and mixtures of various metals. Also, the lines may be either batch dip or continuous operations.

Galvanizing

The batch-dip operation normally follows hot rolling, batch annealing, cold rolling, and pre-forming or cutting to size operations. Rolling lubricants are removed by alkaline cleaning, and final surface preparation is usually provided by acid pickling in stationary tubs with slight agitation. Following pickling, residual acid and iron salts are removed either by an alkaline dip, water rinsing, or prolonged immersion in boiling water. The latter practice has the added advantage of minimizing hydrogen embrittlement. Clean base metal forms are then conveyed, manually or by moving belt, through the flux box section of the coating pot, and immersed in the molten metal. Coated products are withdrawn from the bath and dried by a warm air blast, or chemically treated with ammonium chloride, sulfur dioxide, chromate or phosphate solutions to provide special finishes and surface characteristics. The product may then be rinsed with water and prepared for shipment.

Continuous hot-dip galvanizing, which accounts for more than 60% of total galvanizing production, is practiced with several arrangements of processing steps. The simplest version starts with annealed and tempered steel which receives a light muriatic acid (HCl) pickle and rinse, then proceeds directly through a layer of fluxing agent to the molten zinc bath. The coated product is dried and recoiled, or cut to size for shipment. More elaborate continuous galvanizing lines employ additional stages preceding and following the hot-dip step. At least one strip galvanizer incorporates a sequence of pickling in hot sulfuric acid; rinsing and scrubbing with brushes; a dip into a hot alkaline cleaning solution; scrubbing in alkaline solutions; an electrolytic hot alkaline cleaning step, rinsing and scrubbing with brushes; a light pickle in hot sulfuric acid; rinsing and scrubbing with brushes; a dip into a hot zinc sulfate flux bath; a hot dip into molten zinc; dip and spray with chromate or phosphate solutions; a final water rinse; drying with hot air; and recoiling.

Other producers use a so-called "furnace line" to condition the steel product prior to coating with zinc. The incoming coils are very hard following the cold reduction step unless a separate annealing step is practiced. Furnace line operators include this step in their continuous galvanizing sequence, as follows: cold rolled coils are given a hot alkaline cleaning, rinsing, and scrubbing and a light pickling in hot acid followed by water rinses. The strip is then placed in a controlled atmosphere heating chamber (annealing furnace) up to 60 meters (200 ft.) in length with a series of independently controlled heat zones to provide temperatures required for annealing, yet sufficient cooling so that strip exits the furnace at temperatures slightly above the molten bath temperature. A mixture of NX gas (principally nitrogen, with controlled amounts of methane, carbon monoxide, and carbon dioxide) and cracked ammonia is used in some annealing furnaces to prevent oxidation and decarburization during the annealing process. The exit end of the furnace discharges strip below the surface of the molten zinc bath. A sinker roll submerged near the surface of the molten zinc is used for controlling the thickness and distribution of the coating. Forced air blasts are used to cool the exiting strip and to help solidify the zinc coating. A dip or spray chromate or phosphate chemical treatment may be provided at this point to retard formation of white corrosion products on the coating. A final rinse and drying step may also follow. Finished coated strip is recoiled or cut to size ready for shipment.

Another type of furnace line subjects cold rolled strip to a complex furnace gas containing hydrogen chloride. After annealing and cooling, a light pickling in hydrochloric acid is done immediately prior to entering the flux section of a conventional molten zinc pot. In place of the usual exit rolls for controlling coating thickness, flexible wipes are used to yield very thin, but extremely adherent zinc coatings.

Terne Metal

Terne is an inexpensive, corrosion-resistant hot-dipped coating consisting of lead and tin in a ratio typically near five or six parts lead to one part tin. Lead alone does not alloy with iron, but does form a cohesive solution with tin, which in turn alloys readily with iron, although requiring higher temperatures than for tin alone. A major portion of all terne coated material is used in the automobile industry to manufacture gasoline tanks, with lesser amounts going into the production of automotive mufflers, oil pans, air cleaners, and radiator parts. Other end products made of terne metal include roofing materials, portable fire extinguishers, and burial caskets.

As in the case of hot-dipped galvanizing processes, both batch and continuous terne coating processes are used, although the continuous process is used to supply by far the larger portion of the market. Both metals used in terne coating are corrosion-resistant, as is their combination. But since both lead and tin are cathodic to iron in most environments, corrosion is actually accelerated if any portion of the base metal is exposed. For this reason, terne coatings are usually thicker than other metallic coatings. For maximum corrosion resistance, even the thickest terne coatings benefit from painting or other protective finishing.

The batch-dip terne coating operation normally is performed on cold reduced, batch annealed, and temper rolled coils cut into sheets. Oils and greases are removed by alkaline or solvent (mineral spirits) cleaning, and final surface preparation requires a hydrochloric acid dip just prior to coating. Excess acid is squeezed from the sheets by rubber rolls, and the sheets are conveyed through a flux box containing a hot solution of zinc chloride in hydrochloric acid, or a molten zinc chloride salt bath, to remove any residual iron oxides, and leave a dry steel surface. The sheets are then passed downward through a molten terne metal bath maintained at 325°C to 360°C (617°F to 680°F), where the coating is applied, then upward through an oil bath floating atop the terne pot. This oil tends to maintain the high temperature long enough for oil rolls to control deposition and coating thickness evenly over the sheet surfaces. Although most batch-dipped terne coatings use a single unit as described above, the wider range of coating weights sometimes makes necessary a pass through a second molten metal bath of the same type, but including another oil bath instead of the zinc chloride flux box prior to the application of the second coat.

The steel strip fed to a continuous terne coating operation receives the same preliminary treatment as the steel processed on the batch-dip line, except that it remains in the coil form, and the cleaning procedure prior to pickling is most often done electrolytically. The normal sequence is oil and grease removal in an electrolytic alkaline unit; rinsing and scrubbing with brushes, pickling, terne coating, and oiling by a process similar to batch dipping. After cooling, residual oils are removed in a "branner", which consists of tandem sets of cleaning rolls made of thousands of tightly compressed flannel discs. Middlings from grain milling, called bran, are fed to the first set of rolls to absorb moisture and excess oil, while the remaining rolls distribute a light oil film evenly over the entire coated surface. The final product is then recoiled, or cut to size for shipment as terne coated flats. Additional detail for a terne line is illustrated in Figure III-4.

Aluminum

Another metallic coating applied using the hot-dip technique is aluminum. Products made of aluminum coated steel include bright and matte finished sheets and strip used as building materials in marine, industrial, or other environments where a high degree of resistance to corrosion is required. Aluminum coated wire is used for chain-link and field fencing, barbed wire, telephone wire, and screening.

The batch coating process uses either a conventional molten metal bath, as in zinc or terne coating, or a special cementation process called calorizing. Thoroughly cleaned, degreased, and dried steel products are packed in a rotating drum, along with a mixture of aluminum powder, aluminum oxide, and ammonium chloride. As the drum rotates inside a furnace at 940°C-955°C (1,724°C-1,751°F) a reducing gas is passed into the drum, and the mixture is tumbled for 4-5 hours. A cohesive solution of aluminum in iron, richest in aluminum near the surface, forms the coating. This type of coating is especially effective in protecting steel from oxidation at high temperatures, hence it is used in pyrometer and superheater tubes, and in a variety of oil refinery applications.

The continuous aluminum coating process starts with cold rolled steel strip or steel wire. The strip lines are usually furnace lines, with an annealing step just prior to the hot-dip into molten aluminum. The sequence is much the same as zinc coating on a furnace line. The cold rolled steel coils are cleaned in a hot alkaline solution, rinsed, and given a light pickling in hot acid, followed by a final rinse. An annealing furnace softens the otherwise hard carbon steel, and the coating is applied immediately following the furnace. The strip exiting the aluminum bath is cooled, oiled if required, and recoiled or cut to size for shipment. There is usually no chemical treatment or final rinse following the aluminizing dip.

In making aluminum-coated wire products by the hot-dipped process, clean, cold-drawn carbon-steel wire is passed through the molten aluminum bath at 660°C-680°C (1,220-1,256°F). This temperature is high enough to soften the carbon-steel wire sufficiently that an annealing furnace is not required, but the tensile strength of the wire is reduced, rendering it unsuited for certain applications. This problem is readily corrected by cold-drawing the coated wire, which not only raises the tensile strength, but also provides a very bright final finish to the coating.

Additional detail for an aluminizing line is illustrated in Figure III-5.

Other Hot-Dipped Metallic Coatings

Other hot coating operations involve combinations of zinc and aluminum, zinc and cadmium, or zinc, tin and cadmium. There are also some wire coating operations which use molten tin, or cadmium alone as the coating agent. However, the latter processes comprise a minor fraction of hot-dipped coating operations. The other widely practiced steel coating operation is done from cold solutions using electrical current. Most tin plating production at steel plants is electrolytic, as is all chromium plating and a limited amount of zinc coating. These operations are regulated by guidelines applicable to the electroplating industry.

TABLE III-1

HOT COATING SUBCATEGORY - GALVANIZING SUMMARY

Plant Code No.	Product	1st Year of Prod.	Production Rate Tons/Turn	Production Rate Turns/Day	Oper. Mode	Applied Flow (GPT) Rinse	Applied Flow (GPT) Scrubbers	Discharge Flow (GPT) Rinse	Discharge Flow (GPT) Scrubbers	Treatment Components Process	Treatment Components Central	Trt. Mode	Discharge Mode
0060-01	Strip	1946	111	<1	C	NR	-	NR	-	-	ML,AE,FLP,SS, CL,VF	OT	D
0060-02	Strip	1960	326	2	C	NR	-	NR	-	-		RUX	D
0060B-01	Strip	1955	126	<1	C	E675	-	E675	-	-	CR,ML,AE,FLP, CL,CT,VF	ReTx	D
0060B-02	Strip	1967	265	3	C		-		-	-		ReTx	D
0060G-01	Wire	~1940	*	*	C	*	*	*	*	H(acid)	E,AE, ML,TP	RU61;RT25	P
0060G-02	Wire	1965	*	*	C	*	*	*	*			RU61;RT25	P
0060G-03	Wire	1965	*	*	C	*	*	*	*			RU61;RT25	P
0060G-04	Wire	1967	*	*	C	*	*	*	*			RU76;RT10	P
0060G-05	Wire	1968	*	*	C	*	*	*	*			RU65;RT21	P
0060G-06	Fast.	1966	*	*	B	*	*	*	*	-	E,NC,NA, SL	RT85	P
0060G-07	Fast.	1969	*	*	B	*	*	*	*	-		RT85	P
0060R	Sheet,Plate	1975	61.2	1	B	942	-	314	-	NW	-	RU67	P
0060S-01	Wire	~1950	*	*	C	*	*	*	*	H(acid)	ML,AE	RU88	P
0060S-02	Wire	~1950	*	*	C	*	*	*	*			RU88	P
0060S-03	Wire	1970	*	*	C	*	*	*	*			RU78	P
0068-01	Strip,Bar	1934	13.1	<1	B	916	-	916	-	-	-	OT	P
0068-02	Fence	1934	34.6	<1	C	693	-	693	-	-	-	OT	P
0068-03	Wire	1947	29.6	3	C	1103	-	(1103)	-	-	-	ReU100(1)	P
0068-04	Nails	1920	3.3	3	BC	1425	-	1425	-	-	-	OT	P
0112A-01	Nails	1926	29 max.	<1	B	NR	-	NR	-	-	Scr,AE,ML,SS, FLA,FLP,T,CY	OT	D
0112A-02	Pipe	1929	79	2	B	NR	-	NR	-			OT	D
0112A-03	Sheet	1952	E150	2	C	E490	-	(E464)	-			ReU95(2)	D
0112A-04	Sheet	1955	E250	2	C	E313	-	(301)	-			ReU96(2)	D
0112A-05	Wire	1926	I	I	C	I	-	I	-				D
0112A-06	Wire	1926	13	2	C	NR	2585	NR	2585				D
0112B	Strip	1962	359	3	C	101	308	101	308	-	ML,AE,CL,SS,FDSP	OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 2

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow (GPT)		Discharge Flow (GPT)		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse	Scrubbers	Rinse	Scrubbers	Process	Central		
0112F-01	Wire	1955	6.7	1	C	880	2152	747	143	-	NO$^{(3)}$	RU71	P
0112F-02	Wire	1965	3.8	<1	C	627	4000	533	267	-		RU83	P
0112G	Fasteners	~1930	4	<1	B	NR	900	NR	NR	-	NC	OT	P
0112H	Wire	1971	1.14	2	C	895	-	895	-	-	E,NL,FLP,Cl,SL	OT	D
0112I-01	Fasteners	1922	21.6	1	B	NR	-	NR	-	-	NW,NL,AE,SS, T,FDSP,SL	ReTx	D
0112I-02	Washer,Rod	1970	7.5	<1	B	NR	-	NR	-	-		ReTx	D
0196A-01	Wire	1908	*	*	C	*	*	*	*	NL,CL	SS,SL	OT	D
0196A-02	Wire	1908	*	*	C	*	*	*	*			OT	D
0196A-03	Wire	1916	*	*	C	*	*	*	*			OT	D
0196A-04	Wire	1955	*	*	C	*	*	*	*			OT	D
0196A-05	Wire	1959	*	*	C	*	*	*	*			OT	D
0256D-01	Strip	1955	114	2	C	568	509	568	211	-	NL,FLL,FLP, CL,VF	RU28	D
0256D-02	Strip	1965	228	2	C	274	360	274	147	-		RU34	D
0256G-01	Pipe	~1940	78.5	2	B	107	Dry	107	Dry	-	-	OT	D
0256G-02	Pipe	~1940	78.5	2	B	107	Dry	107	Dry	-	-	OT	D
0264-01	Wire	1959	12.2	3	C	1580	395	596	395	-	NO$^{(3)}$,CL	RU50	P
0264-02	Wire	1963	11.9	3	C	1210	403	605	403	-		RU38	P
0264-03	Fence	1961	18.1	3	C	451	Dry	4.5	Dry	-		RU99	P
0264A-01	Rod	1965	8.2	3	B	1754	585	877	585	-	NO$^{(3)}$,CL	RU37	P
0264A-02	Rod	1965	10.5	3	B	1371	457	686	457	-		RU37	P
0264D-01	Wire	1966	18.6	3	C	3226	Dry	1032	Dry	-	NO$^{(3)}$,CL	RU68	P
0264D-02	Wire	1972	20.9	3	C	2641	344	574	344	-		RU69	P
0384A-01	Strip	1951	106	2	C	31.6	-	31.6	-	-	PSP,SS	OT	D
0384A-02	Strip	1954	153	2	C	21.9	-	21.9	-	-		OT	D
0384A-03	Strip	1955	200	3	C	16.8	-	16.8	-	-		OT	D
0384A-04	Strip	1968	286	3	C	168	Dry	168	Dry	-		OT	D
0432A	Pipe	1930	59	3	C	NR	814	NR	NR	-	FLL,FLP,FLA,CL, SSc,NL,NC,FLP, SS,CL,T,VF	RUx	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 3

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow (GPT)		Discharge Flow (GPT)		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse	Scrubbers	Rinse	Scrubbers	Process	Central		
0432B	Strip	1956	180	3	C	2.2	-	2.2	-	-	-	OT	P
0432D	Sheet/Strip	1968	346	3	C	289	-	289	-	-	FLL,FLW,T,FDSP	OT	D
0448A	Sheet	1967	212	3	C	0.95	-	0.95	-	-	NO(3)	OT	P
0460A-01	Wire	1932	4.0	3	C	4560	-	4200	-	-	PSP,AE,NL,FLP,CL, SL	RU8	D
0460A-02	Wire	1944	9.7	3	C	2227	-	1979	-	-		RU11	D
0460A-03	Wire	1932	21.6	3	C	1000	316	889	316	-		RU8	D
0460A-04	Wire	1930	21.6	3	C	1222	-	1111	-	-		RU9	D
0460A-05	Wire	1934	18.2	3	C	1451	-	1319	-	-		RU9	D
0460A-06	Wire	1934	18.2	3	C	1187	-	1055	-	-		RU11	D
0460A-07	Wire	1934	29.9	3	C	722	-	642	-	-		RU11	D
0460A-08	Wire	1947	13.3	3	C	1913	-	1805	-	-		RU6	D
0460A-09	Wire	1949	8.3	3	C	1908	-	1735	-	-		RU9	D
0460A-10	Wire	1950	3.3	3	C	2327	-	2182	-	-		RU6	D
0460A-11	Wire	1974	11.7	3	C	2872	583	2667	583	-		RU6	D
0460C	Wire	1967	18.6	3	C	1080	806	5.4	0	-	-	RU99+	P
0460D-01	Wire	~1927	15.1	3	C	993	-	NR	-	-	NL,FLP,CL,T,VF	RTx	D
0460D-02	Wire	~1927	15.1	3	C	993	-	NR	-	-		RTx	D
0460E-01	Wire Cloth	1970	1.8	3	C	1311	-	1311	-	-	FLP,NL,CL,FDSP, CL,MA	OT	D
0460E-02	Wire	1947	16.5	3	C	873	-	873	-	-		OT	D
0460F-01	Wire Cloth	1965	0.34	3	C	706	-	141	-	-	NL	RT80	P
0460F-02	Wire	1965	3.1	3	C	627	-	125	-	-		RT80	P
0460G	Wire	1968	10	3	C	1344	-	1344	-	-	NO(3),SL	OT	P
0460H-01	Wire	1925	1.8	2	B	507	-	507	-	-	-	OT	P
0460H-02	Wire	1925	1.8	2	B	507	-	507	-	-	-	OT	P
0476A-01	Wire	~1930	3.6	2	C	2950	1609	2950	1609	-	SCR,SS,NL,AE, FLP,CL,VF	OT	D
0476A-02	Wire	~1930	5.6	3	C	1886	1029	1886	1029	-		OT	D
0476A-03	Pipe	1930	60	1	B	56	Dry	56	Dry	-		OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 4

Plant Code No.	Product	1st Year of Prod.	Production Rate Tons/Turn	Production Rate Turns/Day	Oper. Mode	Applied Flow (GPT) Rinse	Applied Flow (GPT) Scrubbers	Discharge Flow (GPT) Rinse	Discharge Flow (GPT) Scrubbers	Treatment Components Process	Treatment Components Central	Trt. Mode	Discharge Mode
0492A	Pipe	1962	62	1	C	1355	387	(1355)	0	PSP	SS,SL	ReT100	Z
0580A-01	Wire Cloth	1962	1.3	3	C	4615	-	923	-	-	NW,NL,FDSP	ReT80	D
0580A-02	Wire Cloth	1962	1.3	3	C	4615	-	923	-	-		ReT80	D
0580G-01	Wire	~1960	0.38	<1	C	5600	-	5600	-	-	-	OT	P
0580G-02	Wire	~1960	0.75	<1	C	2800	-	2800	-	-	-	OT	P
0584C-01	Strip	1956	91	1	C	1688	1319	1688	158	-	SL,SS,CLB,CR,FDSP	RU39	D
0584C-02	Strip	1962	214	2	C	710	67.3	710	67.3	-		OT	D
0584C-03	Strip	1964	161	3	C	1043	-	1043	-	-		OT	D
0584E-01	Sheet	1960	135	2	C	NR	NR	NR	NR	-	SL,NW,NL,BOA2,CO,CR,EB,FDSP,IX,CL,SS	OT	D
0584E-02	Sheet	1970	291	3	C	NR	NR	NR	NR	-		OT	D
0584F-01	Strip	1957	207	3	C	1391	-	1391	-	-	SL,SC	OT	D
0584F-02	Strip	1958	79	1	C	3646	-	3646	-	-		OT	D
0584F-03	Strip	1966	187	3	C	1540	-	540	-	-		OT	D
0612-01	Wire	~1950	22.3	3	C	1510	-	(196)	-	FDSP	-	ReT87	D
0612-02	Wire	~1950	22.3	3	C	1510	-	(196)	-		-	ReT87	D
0612-03	Wire	~1950	22.3	3	C	1510	-	(196)	-		-	ReT87	D
0612-04	Wire	~1950	22.3	3	C	1510	-	(196)	-		-	ReT87	D
0612-05	Fence	~1950	5.4	2	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0640-01	Fence	1936	17	3	C	529	-	529	-	NC	-	OT	P
0640-02	Wire	1936	34	3	C	3950	-	1127	-	-	NL,CL,VF,SL	RU71	D
0640-03	Wire	1966	9.2	3	C	6522	-	2609	-	-		RU60	D
0640B	Wire	~1950	5	3	C	4800	-	4800	-	-	FLP,NC,CL	OT	D
0684A	Pipe	1940	71	1	C	608	Dry	608	Dry	H(acid)	-	OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 5

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow (GPT)		Discharge Flow (GPT)		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse	Scrubbers	Rinse	Scrubbers	Process	Central		
0684B	Strip	1962	154	3	C	2026	312	2026	0	H(acid)	SL,SS	ReU13	D
0684I	Strip	1958	171	2	C	1951	Dry	1951	Dry	-	NW,BOA1,SL,SS	OT	D
0684Y	Rod,Plate, Struct.	1934	*	*	B	*	-	*	-	-	E,NL,CL,FLP,FDSP	OT	D
0724A	Sheet	1952	106	3	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0728	Pipe	1952	25	1	B	480	Dry	0	Dry	H(acid)	SL,PSP,SSP,CT	RT100	Z
0856D-01	Sheet	1947	144	1	C	333	-	333	-	-	NL,FLP,T,SS	OT	D
0856F-01	Sheet	1968	266	2	C	586	189	586	189	-	CR,NW,NL,FLP,CL,SS	OT	D
0856F-02	Pipe	1953	74	<1	B	2270	7784	2270	0	PSP,SS	GF,FLP,SL,BOA1,SS	RU77	D
0856N-01	Pipe	1947	150	<1	C	112	-	0	-	FDSP	-	RT100	Z
0856N-02	Pipe	1941	78	<1	C	214	-	0	-			RT100	Z
0856N-03	Pipe	1908	77	<1	B	218	-	0	-			RT100	Z
0856P	Wire	1917	5.6	1	C	15,540	14,520	15,540	0	H(acid)	-	ReU48	D
0856S-01	Wire	1927	6.3	3	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0856S-02	Wire	1937	1.8	2	C	0(dry)	-	0(dry)	-	-(dry operation)	-	-	Z
0860D-01	Sheet/Strip	1950	321	1	C	935	-	935	-	-	NL,FLP,SL	OT	D
0860D-02	Sheet/Strip	1957	160	1	C	1385	-	1385	-	-		OT	D
0860D-03	Sheet/Strip	1962	109	2	C	1835	-	1835	-	-		OT	D
0860F-01	Wire	1942	23	2	C	3130	-	157	-	DW(acid)	NL,NA,PSP,T, VF,FDSP,CT	RU95,RT4.5	D
0860F-02	Wire	1942	12.5	1	C	5760	-	9.6	-			RU97,RT2.6	D
0860F-03	Wire	1942	12.5	1	C	5760	-	6.4	-			RU95,RT4.5	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 6

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow (GPT)		Discharge Flow (GPT)		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse	Scrubbers	Rinse	Scrubbers	Process	Central		
0860G-01	Wire	1942	8.8	2	C	8182	-	0	-	PSP	-	RT100	Z
0860G-02	Wire	1940	23.8	2	C	3025	-	0	-		-	RT100	Z
0860G-03	Wire	1944	4.6	I	C	I	-	I	-	-	-	I	-
0864B-01	Wire	1937	19.7	2	C	4386	-	4386	-	-	NL,MA,FLL, FLP,CL,SK	OT	D
0864B-02	Wire	1943	9.4	2	C	6128	-	6128	-	-		OT	D
0864B-03	Nails	1943	7.1	2	B	6761	2028	6761	0	-		RU23	D
0864B-04	Sheet	1951	121	3	C	2182	-	1091	-	-		ReU50	D
0864B-05	Sheet	1963	288	2	C	325	8.3	325	8.3	-		OT	D
0864B-06	Pipe	1966	132	<1	B	727	145	727	0	-		RU17	D
0868A-01	Sheet	1948	87	3	C	182	-	(182)	-	-	CR,FDSP,CL,SS,SL	ReT88	D
0868A-02	Sheet	1952	117	3	C	135	-	(135)	-	-		ReT88	D
0868A-03	Sheet	1968	313	3	C	169	15.3	(169)	(15.3)	-	FLP,FLW,NL,CL, SS,SL	ReT88	D
0868A-04	Wire	1914	12	3	C	960	-	960	-	DW(acid)	-	OT	D
0868A-05	Nails	1914	7	2	B	2326	-	2326	-	PSP	-	OT	D
0916A-01	Pipe	1937	200	1	B	0(dry)	Dry	0(dry)	Dry	-(dry operation)	-	-	Z
0916A-02	Pipe	1974	142	1	B	0(dry)	Dry	0(dry)	Dry	-(dry operation)	-	-	Z
0916A-03	Couplings	1942	4	<1	B	120	-	0	-	-	-	RU100	Z
0920D-01	Pipe	1950	75	2	B	640	640	64	0	PSP,SSP	-	RT45,RU50	D
0920D-02	Pipe	1972	40	1	B	120	1620	120	0		-	RU93	D
0920E-01	Sheet/Strip	1966	331	2	C	116	290	116	290	NL,FLP, T,VF	-	OT	D
0920E-02	Sheet/Strip	1955	212	2	C	136	430	136	430		-	OT	D
0920E-03	Sheet/Strip	1953	146	2	C	164	395	164	395		-	OT	D
0948A	Pipe	1922	63	2	B	7.6	Dry	7.6	Dry	-	AO,FLL,FLP,TP,VF	OT	D
0948C-01	Strip	1961	171	2	C	140	-	140	-	-	FLL,FLP,T,SS	OT	D
0948C-02	Strip	1964	261	3	C	92	-	92	-	-		OT	D

TABLE III-1
HOT COATING SUBCATEGORY - GALVANIZING SUMMARY
PAGE 7

Key to Abbreviations and Symbols

GPT: Gallon per ton of coated product
C : Continuous coating operation
B : Batch coating operation
~ : Approximately
NR : Data not reported by plant
* : Company has requested confidential treatment of this data
D : Direct discharge
P : POTW
Z : Zero
OT : Once-through

RU : Recycled to coating operation untreated
RT : Recycled to coating operation after treatment
ReU: Untreated wastewater reused elsewhere
ReT: Treated
I : Line is now inactive
( ): Indicates flow reused elsewhere
- : None
x : Percent unknown
For RU,RT,ReU, and ReT, number following symbol indicates percent of flow recycled or reused.

Footnotes

(1) Reused at H_2SO_4 pickler
(2) Reused as mill service water
(3) Neutralization using ammonia

NOTE: For abbreviations used under "Treatment Components," see Table VII-1.

TABLE III-2

HOT COATING SUBCATEGORY - TERNE COATING SUMMARY

Plant Code No.	Product	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow (GPT)		Discharge Flow (GPT)		Treatment Components		Trt. Mode	Discharge Mode
			Tons/ Turn	Turns/ Day		Rinse	Scrubbers	Rinse	Scrubbers	Process	Central		
0060-03	Strip	1949	71	2	C	E670	-	E670	-	-	NL,FLP,SS, CL,VF,AE	OT	D
0060-04	Strip/Sheet	1962	103	3	C	E466	E116	E466	E116	-		OT	D
0648	Strip	1968	4.5	<1	C	533	Dry	533	Dry	None	None	OT	P
0684B-03	Strip	1957	75	3	C	640	1280	640	1280	H(acid)	SL,SS	OT	D
0856D-02	Strip/Sheet	1964	187	3	C	2567	128	2567	128	-	SS,NL,FLP,T	OT	D
0920F	Sheet	1962	51	3	SC	301	-	160H 141D	-	H(acid),SS	-	H53%, BD47%	D

GPT: Gallons per ton of terne coated product
E : Estimated flow from plant DCP response
C : Continuous
SC : Semi-continuous
H : Hauled off-site by contractor
D : Discharged directly to receiving stream
OT : Once-through
BD : Blowdown from treatment (discharged)
P : Discharged indirectly via a publicly owned treatment works (municipal sewage treatment plant)

NOTE: For abbreviations under "Treatment Components," see Table VII-1.

TABLE III-3

HOT COATING SUBCATEGORY - OTHER METAL COATING SUMMARY

Plant Code No.	Product	Coating	1st Year of Prod.	Production Rate		Oper. Mode	Applied Flow (GPT)		Discharge Flow (GPT)		Treatment Components		Trt. Mode	Discharge Mode
				Tons/Turn	Turns/Day		Rinse	Scrubbers	Rinse	Scrubbers	Process	Central		
0112A-07	Sheet	Al/Zn	1972[(1)]	125	<1	C	461	-	(457)	-	-	SCR,NL,AE,FLP,SL,	ReU99+[(2)]	D
0112C	Wire	Al	1960	8.8	2	C	NR	-	NR	-	ES(acid)	AE,NL,CL,T	OT	D
0112I-03	Fasteners	Al	1955	1.2	<1	B	NR	-	NR	-	-	NW,NL,T,FDSP, SS,SL	OT	D
0384A-5	Strip	Al	1961	208	3	C	16	Dry	16	Dry	-	PSP,SS	OT	D
0460H-03	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-04	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-05	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-06	Wire	Sn	1925	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-07	Wire	Sn	1964	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-08	Wire	Sn	1973	0.7	2	B	1270	-	1270	-	-	-	OT	P
0460H-09	Wire	Sn	1973	0.7	2	B	1270	-	1270	-	-	-	OT	P
0580G-03	Wire	Sn	~1960	0.3	3	C	800	-	800	-	-	-	OT	P
0580G-04	Wire	Sn	~1960	1.0	1	C	300	-	300	-	-	-	OT	P
0580G-05	Wire	Cd	~1960	0.3	<1	C	2424	-	2424	-	-	-	OT	P
0580G-06	Wire	Cd/Sn/ Zn	~1960	0.8	3	C	5250	-	5250	-	-	-	OT	P
0684B-02	Wire	Sn	~1950	1.0	2	C	7200	-	7200	-	-	FLP,NC,CL	OT	P
0792A	Wire	Cd/Zn	1934	0.3	<1	C	1832	-	1832	-	-	-	OT	P
0792B	Strip	Sn	1950	0.6	2	C	80	Dry	0	Dry	-	CT	RT100	Z
0856D-03	Sheet	Al/Zn	1949	172	2	C	558	-	558	-	-	FLP,NL,SS,T	OT	D
0860F-04	Wire	Al	1942	15	2	C	10,800	11,520	640	0	-	NL,SSP,T,VF,FDSP, CT	RU97	D

TABLE III-3
HOT COATING SUBCATEGORY - OTHER METAL COATING SUMMARY
PAGE 2

Key to Abbreviations and Symbols

GPT: Gallons per ton of coated product
C : Continuous coating operation
B : Batch coating operation
~ : Approximately
NR : Data not reported by plant
OT : Once-through
ReU: Reused untreated
RU : Recycled to coating line untreated
RT : Recycled to coating line treated
D : Discharge directly
P : Discharged via POTW
Z : No discharge
- : None
Al : Aluminum
Sn : Tin
Cd : Cadmium
Zn : Zinc

Footnotes

(1) Converted from galvanizing to Al/Zn in 1972; line actually built in 1956.
(2) Reused as mill service water.

NOTE: For abbreviations under "Treatment Components," see Table VII-1.

TABLE III-4

HOT COATING DATA BASE

	No. of Plants	% of Total No. of Plants	Annual Capacity of Plants In Data Base	% of Total Estimated Annual Capacity
Plants sampled for DD - 3/76	6	7.5	1,128,920	12.9
Plants sampled for this study	7 (incl. 2 above)	8.8 (incl. 2.5 above)	1,067,300 (incl. 683,200 above)	12.2 (incl. 7.8 above)
Total plants sampled	11	13.8	1,513,020	17.3
Plants to receive detailed DCP	9 (incl. 1 above)	11.3(incl. 1.3 above)	1,989,260 (incl. 537,420 above)	22.8 (incl. 6.1 above)
Plants sampled and/or solicited via detailed DCP	19	23.8	2,964,860	34.0
Plants responding to basic DCP	66 sites*	82.5	8,469,560	97.1
Estimated total no. of hot coating plants in industry	80 sites	100.0	8,725,000	100.0

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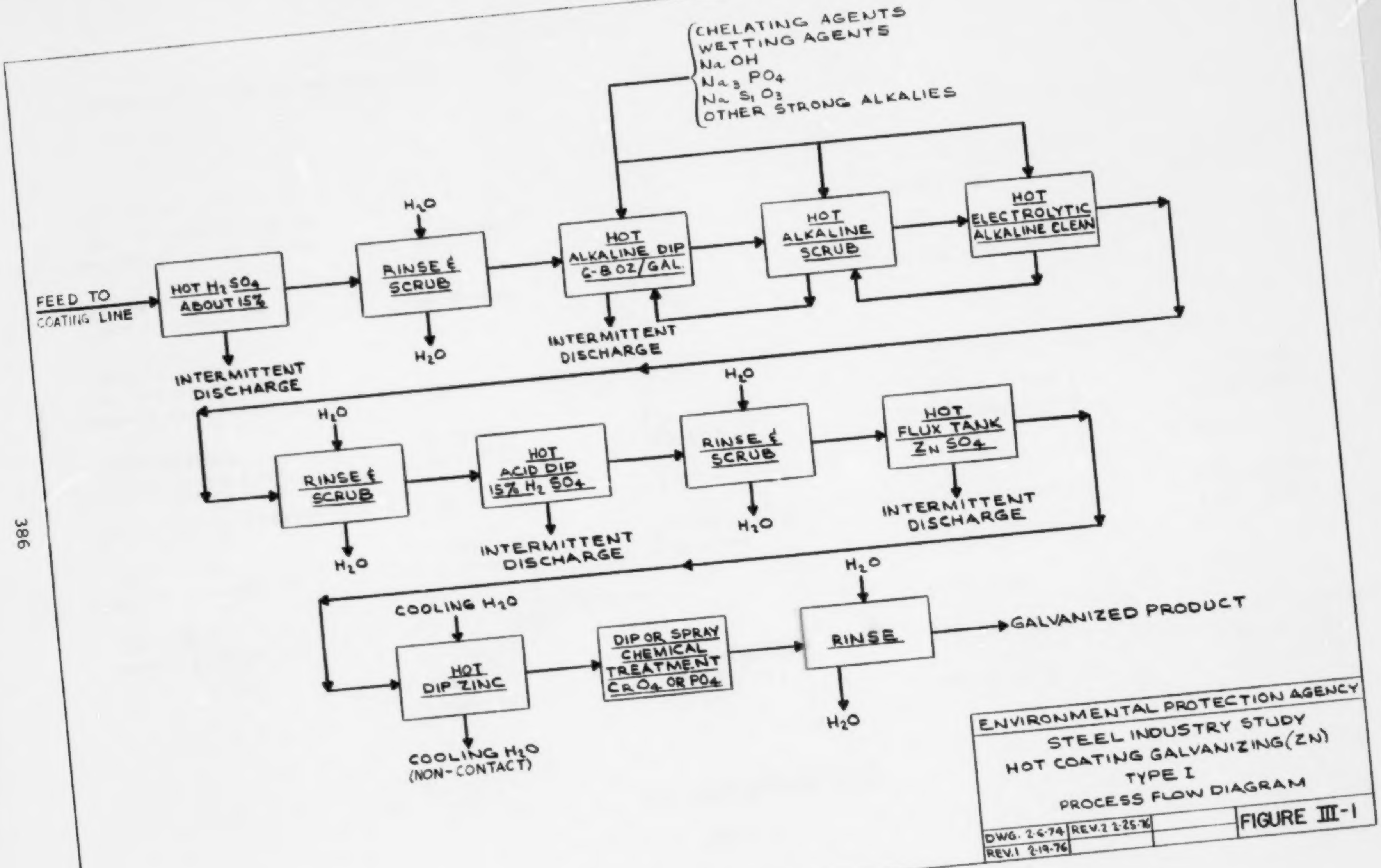
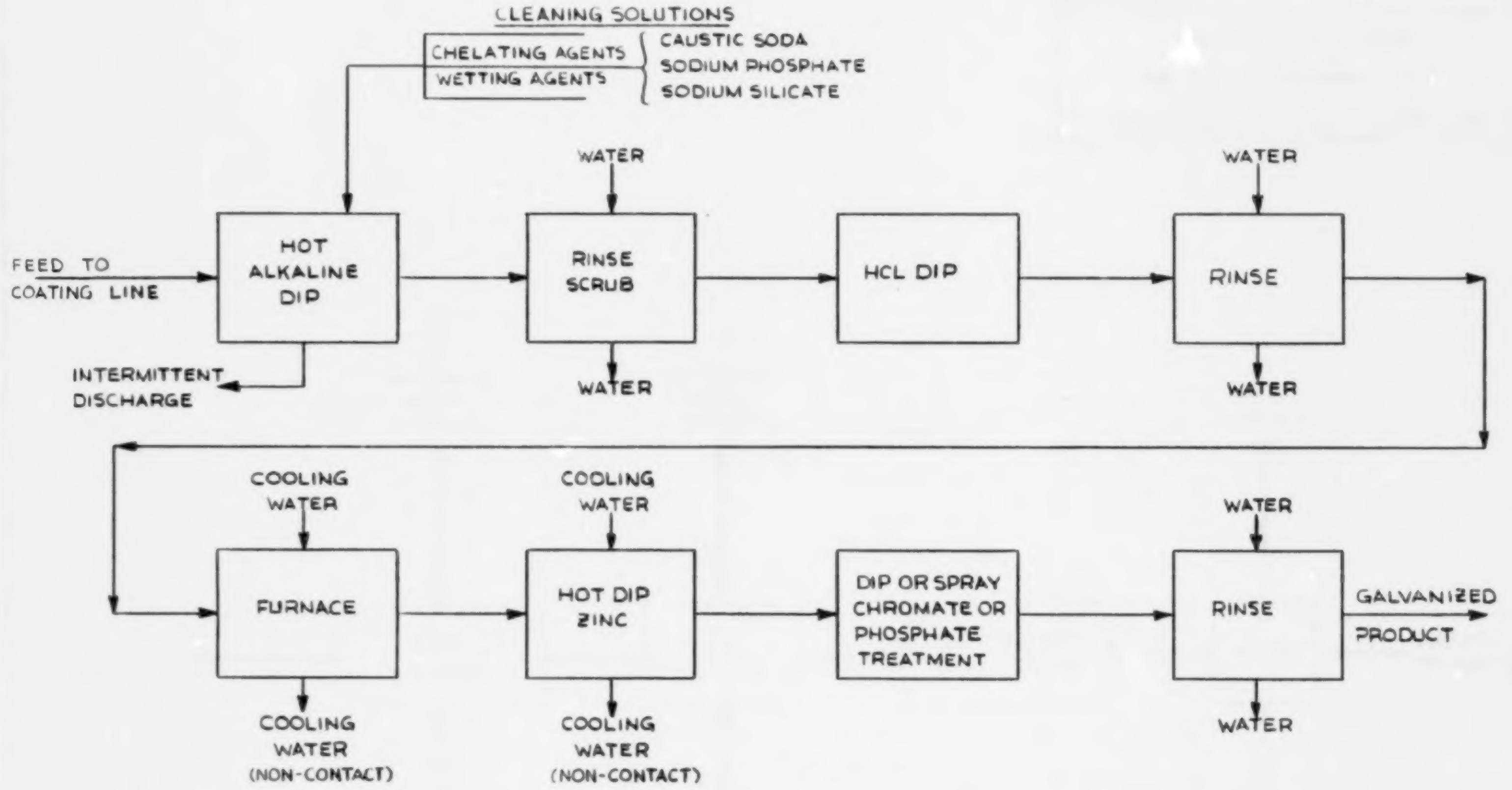
* Representing 174 production lines



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATING GALVANIZING (ZN)
TYPE I
PROCESS FLOW DIAGRAM

FIGURE III-1

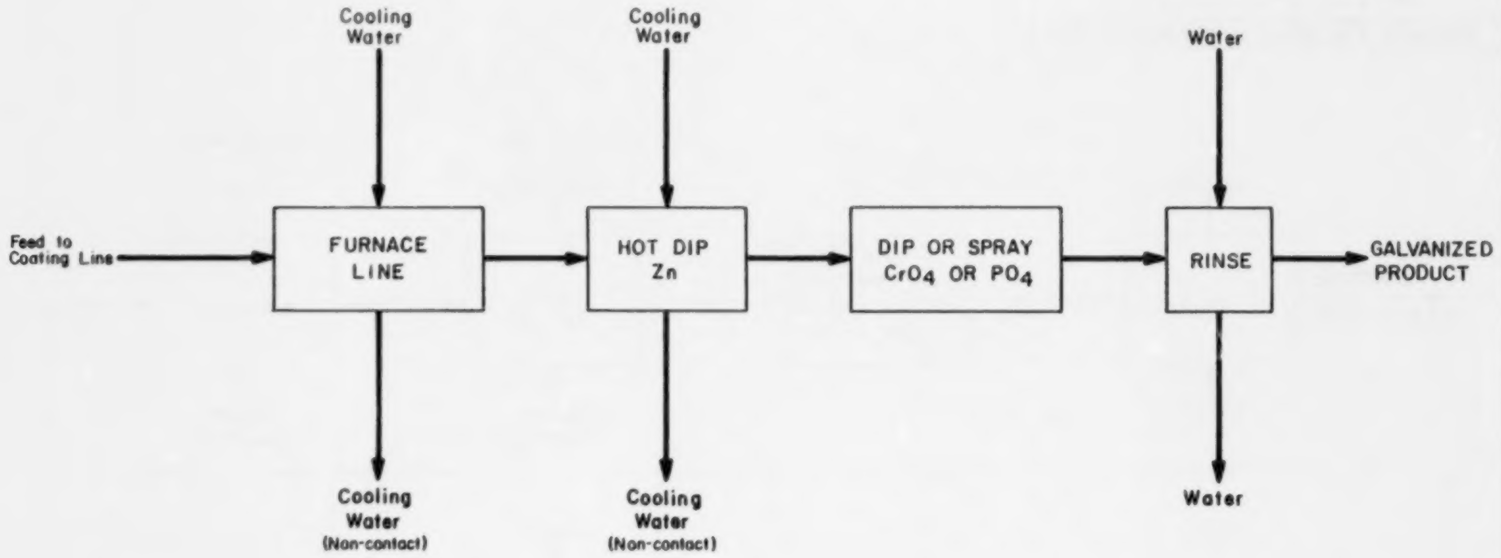


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING GALVANIZING (ZN)
TYPE II U.S. STEEL PROCESS
PROCESS FLOW DIAGRAM

DWG 2-6-74 REV 2 2-25-76
REV 1 2-19-76

FIGURE III-2

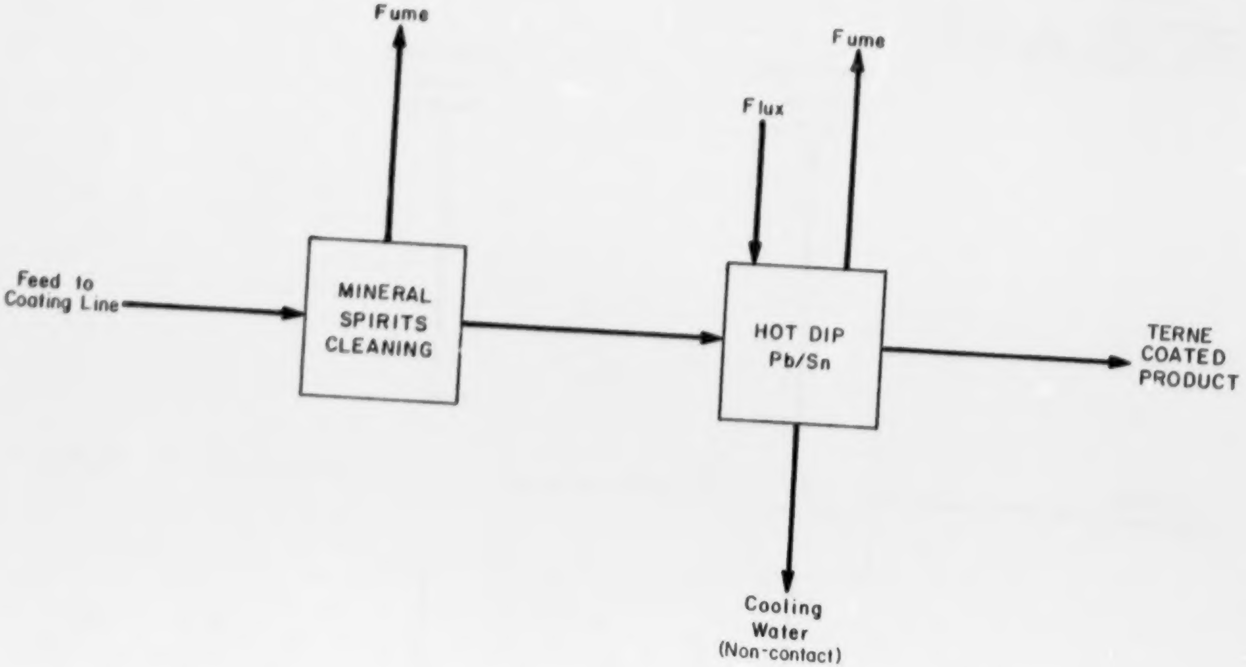


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING GALVANIZING (Zn)
TYPE II
PROCESS FLOW DIAGRAM

Dwn. 2/22/79

FIGURE III-3

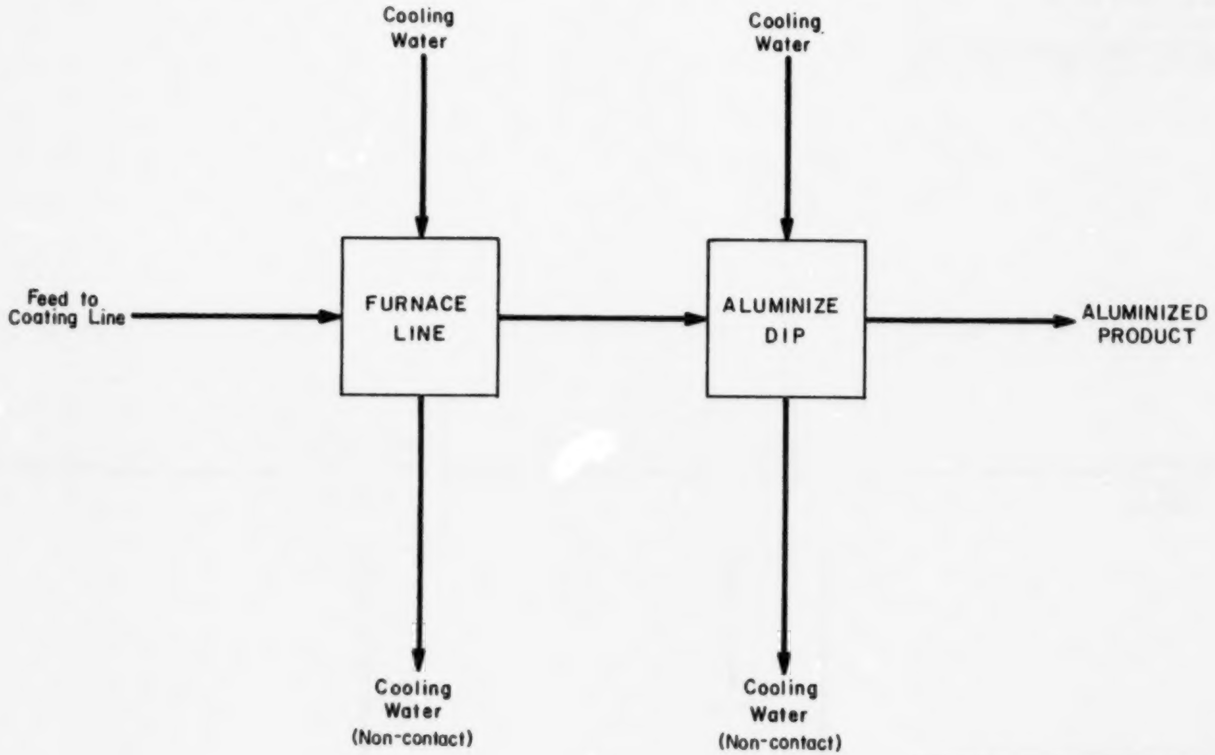


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING TERNE PLATE
PROCESS FLOW DIAGRAM

Dwn. 2/21/79

FIGURE III-4



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING ALUMINIZING
PROCESS FLOW DIAGRAM

Dwn. 2/21/79

FIGURE III-5

HOT COATING SUBCATEGORY

SECTION IV

SUBCATEGORIZATION

Plants involved in forming and finishing steel assume a wide variety of configurations, from simple layouts (e.g., a wire drawing operation starting with purchased rod or heavy wire brought in from elsewhere) to extremely complex (e.g., an integrated steel plant with all steel melting, refining, forming and finishing operations at a single site). Moreover, forming and finishing operations at any particular site may be of one type (pipe and tubemaking, cold rolling, coating), or may be a sequence involving many operations (primary breakdown of ingots into slabs, rolling of slabs into coils of strip, pickling and cold reduction of strip, cleaning and hot-dipping of strip to form a final galvanized product). The basic subcategorization of forming and finishing operations into subprocesses has been retained. This section deals with coating operations only, and in particular with hot dipped metallic coatings. Factors evaluated with respect to subcategorization and further subdivision are discussed below.

Factors Considered in Subcategorization

Manufacturing Process and Equipment

The inherent manufacturing or production processes associated with the production of steel products serves as a basis for defining subcategories. The types of equipment used, and the processes themselves, vary sufficiently to justify their separation into different subcategories and into further subdivision within certain subcategories.

Coating operations within the steel industry are usually performed by either of the following methods:

Hot Dip Process

Steel is immersed in a molten bath of the coating metal, then removed from the bath in such a way that the coating is uniformly distributed over the metal surface as free of discontinuities as possible. Most zinc coatings, and all aluminum and terne (a lead/tin alloy) coatings are applied in this manner. In the past, tin was also applied as a hot-dipped coating, but the electrolytic tin plate process has almost completely supplanted this practice, except for hot dip coating of wire and wire products. Other metallic coatings which are applied by the hot dip process include aluminum, cadmium, lead, and combinations of these metals with each other or with zinc.

Electrolytic Process

Most tin coatings, all chromium coatings and a minor fraction of zinc coatings are applied electrolytically. For details on this process and for applicable limitations refer to 40 CFR Part 413 as amended, and to the Development Document for the Electroplating Point Source Category.

Raw Materials

The primary raw material, carbon steel, is common to all hot coating operations observed. However, the other different raw materials used in hot coating processes indicated a potential need to subdivide the hot coating subcategory by coating metal. In addition to the coating metals, the other raw materials used include pickling acids and rinses, cleaning solutions, fluxes and oils. Not all operations involve all raw materials. For example, all terne coating and wire galvanizing lines surveyed were found to be using fluxes, as were virtually all galvanizers coating miscellaneous shapes. However, fluxes are used in only 21% of strip and sheet galvanizing operations. Pickling acids vary in strength and in composition. Rinsing depends to some extent on the strength and nature of the acids, but even more so on the shapes being coated. Such differences contribute to the need for subdivision of hot coating operations along the lines selected, that is, by type of metallic coating and by type of product being coated. Further discussion follows in Sections V and VI.

Final Products

A variety of final products are made when coatings are applied to different steel shapes. The most common hot coated products include galvanized steel strip, sheet, pipe, tube, rods, bars, fasteners, wire and wire products, nails, plate, couplings, and various structural shapes. Strip and sheet may in turn be formed into useful shapes, such as auto parts, architectural components, containers, gutters, and channels. In some cases, certain formed shapes are redipped into molten baths to insure that the coatings are completely covering the base metal.

Hot coated products other than galvanized ware include terne coated strip and sheet which is used for automobile parts, burial caskets, fire extinguishers, steel bands and roofing materials.

Aluminum coatings are applied to steel strip and sheet for decorative and corrosion resistant qualities. These flat products are then formed into architectural shapes, gutters, channels, auto body components, and other uses. Nails, bolts, nuts, fasteners, and wire are also aluminized by hot coating processes.

Wire and wire products (chain-link fence, wire cloth) are usually galvanized, but other hot coatings are also routinely applied, namely tin, cadmium, aluminum, and combinations using tin, cadmium, and zinc. Another product involving combinations of metals is strip which has been coated with "galvalume", a combination of aluminum and zinc.

The use of such diverse coating metals to cover a variety of shapes and sizes had led the Agency to subdivide the hot coating operations into three major groupings - galvanizing, terne coating, and other hot metallic coatings. For galvanizing and other coating, further differences occur for selected final products where appropriate, due to differences in water application rates. These are discussed in more detail in this section under "Process Water Usage," and in Sections V and VI.

Wastewater Characteristics and Treatability

Wastewater characteristics and treatability are related to the coating metal, and provide further justification for the need to subdivide hot coating processes into galvanizing, terne coating and other metallic coatings. Certain pollutants are generated when galvanizing is practiced that are not generated by terne coating, and vice versa. And the absence or presence of such pollutants determine, to a large extent, the treatment of the wastewater prior to final treatment. For example, hexavalent chromium from some galvanizing operations must be reduced to the trivalent state prior to neutralization and precipitation as the hydroxide. This requires equipment that is unnecessary for the treatment of terne coating or aluminizing wastewaters. On the other hand, the presence of lead in terne coating effluents necessitates special precautions to prevent discharge of that pollutant from rinses or scrubber wastewaters from terne coating lines. These wastewater characteristics and treatability differences support a subdivision of hot coating operations into different parts based upon metallic coating and product coated.

Size and Age

The Agency considered the impact of size and age on the need to further subdivide hot coating operations and found the impact to be much less signficant than the other factors evaluated. No impact from age of hot coating lines was found. Some of the most advanced wastewater treatment systems treat wastewaters from old coating lines. Very often these systems treat wastewaters from a variety of finishing operations, old and new, at the same time. The quality characteristics of raw wastewater and its treatability were likewise found to be unaffected by the age of a given hot coating line. Data for those plants responding to data collection portfolios (DCPs) were plotted showing applied flow versus the year of installation of the oldest active hot coating operation on-site and is shown in Figure IV-1. No correlation was found between age and process flows. Plants of all "ages" appear to have both extremes of applied flow, with most flows between 400 and 2000 gallons per ton of coated product.

A similar plot shown in Figure IV-2, of applied flow versus production rate (size) indicated that size is reflected indirectly when final products are considered. Continuous strip galvanizing lines are considerably larger in terms of production than their aluminizing or terne coating counterparts. Likewise, strip and sheet coating lines, no matter what metal is involved in coating, are larger than wire coating lines, or lines coating any of the miscellaneous shapes. But these differences are better accounted for by subdividing the subcategory based upon the type of metal coating and on process water usage due to product requirements, rather than on the basis of size or age of a plant.

Figure IV-2 also shows how size appears to be significant in the number of plants which discharge wastewaters to POTWs. The large hot coating operations (strip, sheet, and larger miscellaneous shapes which are produced at rates exceeding 200 tons per turn) rarely discharge wastewaters to POTWs, while approximately 40% of the wire and wire products lines discharge to municipal treatment plants. Such differences are accounted for in the development of separate effluent limitations and standards for the wire products and fasteners segments. Thus, subdivision by size becomes unnecessary since potential size-related distinctions have been covered by subdivision according to metal coating and final product. Size and age in themselves do not affect the attainability of the proposed limitations or standards.

The Agency also investigated the effect of age on the feasibility and cost of retrofitting pollution control equipment at hot coating lines. Comparison of the age of a hot coating line with the year in which pollution control facilities were installed (see Table IV-1), demonstrate that pollution control equipment can be retrofitted. The discussion in the preceding paragraphs show that similar rates of pollutant discharge are achievable at hot coating lines of all ages. As a result the Agency has concluded that retrofitting pollution control to hot coating lines is feasible.

The cost of retrofitting wastewater treatment systems to existing production units was investigated as part of detailed data collection portfolios (D-DCPs) circulated to selected hot coating operations. Operators were asked to identify costs which would not have been incurred if treatment was installed concurrently with production units or during major rebuilds of production facilities. Nine plants responded to this portion of the DCP. Four plants could not determine retrofit costs for hot coating treatment since a central treatment plant had been installed, and costs, if any, could not be segregated.

Four plant's central treatment systems could not quantify retrofit costs, either because they were insignificant or impossible to estimate with sufficient accuracy. No retrofit costs were reported for two plants, the smallest galvanizer and a terne coating line. In one case, a lagoon was added to an existing treatment facility, but this was considered by the plant to be an upgrading cost, not a retrofit cost. Retrofit costs for the remaining three plants were listed as unknown, although the operator of a $1,650,000 central treatment system estimated that he could have saved 25-50 percent if he were building a greenfield system adjacent to his production units. Treatment had to be installed 1500 to 2000 feet from the wastewater sources, most of which were acid pickling operations. The Agency estimates that $670,000 of this $1,650,000 central treatment plant is attributable to the treatment of hot coating wastewaters. Model-based estimates of treatment facilities on-site at this location indicates BPT facilities costing $694,000 are dedicated to hot coating wastewater, a figure which is only 3.6 percent greater than plant reported costs. Even though plant personnel estimate that 25-50 percent of their costs are attributable to "retrofit", the money spent is not significantly different than estimated costs based on the models used throughout this study. It is likely that a portion of the so-called "retrofit" costs are really site-specific since new plants have, in the past, constructed central treatment systems at considerable distances from the wastewater sources (Plant 0856F).

A similar case was observed at Plant NN-2/118. Costs reported for this plant treating galvanizing wastewater alone were an initial investment of $1,500,930, versus EPA's estimated in-place cost of $1,965,000 based on model costs. This treatment plant is also detached by a considerable distance from the production units, yet reported costs compare reasonably well with other plants and with model-based estimates. Hence, the Agency concludes that its model-based cost estimates are sufficient to cover site-specific and retrofit costs for both separate and central treatment systems.

The Agency, thus, concludes that size and age have no significant effect on further subdivision or segmenting of the subcategory.

Geographic Location

Hot coating operations are widespread, with no significant distinctions noted due to geographic location. DCP respondents included plants from twenty-one different states, and a recent membership list of the American Hot Dip Galvanizers Association indicates that galvanizing is practiced in forty-one different states. However, about 60% of all hot coating operations are situated in four states - Pennsylvania, Illinois, Ohio and California. Since operations are nearly always confined within an enclosed building, the effects of climate and adverse weather are greatly minimized. Special consideration of water problems for "arid" or "semi-arid" regions is not necessary, since the model treatment systems do not involve significant water consumption. "Arid" or "semi-arid" region plants are presently operating coating lines and wastewater treatment systems comparable to those employed in other parts of the nation and will have no unusual problems in upgrading existing systems. Hence, the Agency concluded that further subdivision of the hot coating subcategory based upon geographic location was not warranted.

Process Water Usage

The Agency reviewed the process water applied rates and effluent discharge rates using data obtained from the basic DCPs. This review revealed that most hot coated products required similar application rates for rinsing and fume scrubbing regardless of coating metal. This is particularly true for coating operations for strip, sheet, pipe, tube, rod, bar, plate and miscellaneous structural shapes. Exceptions were noted for fasteners, nails, wire and wire products. Uniformly higher process water application rates are required for these products regardless of coating metal. These rates were substantially different from the basic flows for other products because of the large increase of surface areas per unit of weight for wire, nails, fasteners, and wire products. Hence, the Agency made adjustments for additional water requirements for rinsing and fume scrubbing. Refer to Section V (Water Use and Waste Characterization) for further discussion of these differences. The impact of water usage is significant enough to require additional allowances under the established subdivisions but does not require changing the basis for subcategorization itself. The once-through process wastewater flows are identical with applied flows for all hot coating subdivisions and are as follows:

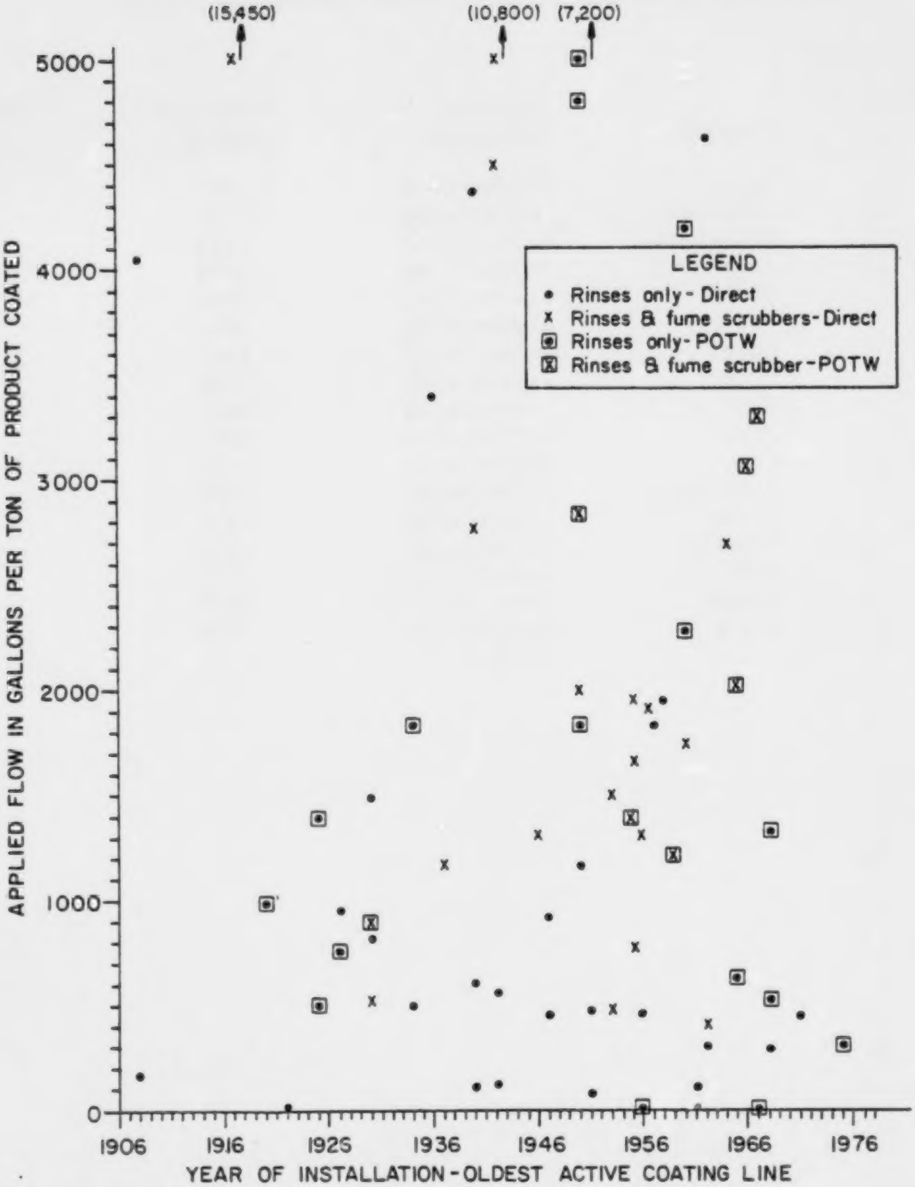
	Rinsewater Flow (Gal/Ton)	Fume Scrubber Flow (Gal/Ton)
All Strip, Sheet, Pipe, Plate, Rod, Structural & Misc. Products	600	600
All Wire, Nail, Fastener, Chain Link Fence and Other Wire Products	2,400	1,500

Note that process water usage is independent of the metallic coating being applied, but highly dependent on product coated. Justification for the subdivision by product is provided in Section IX.

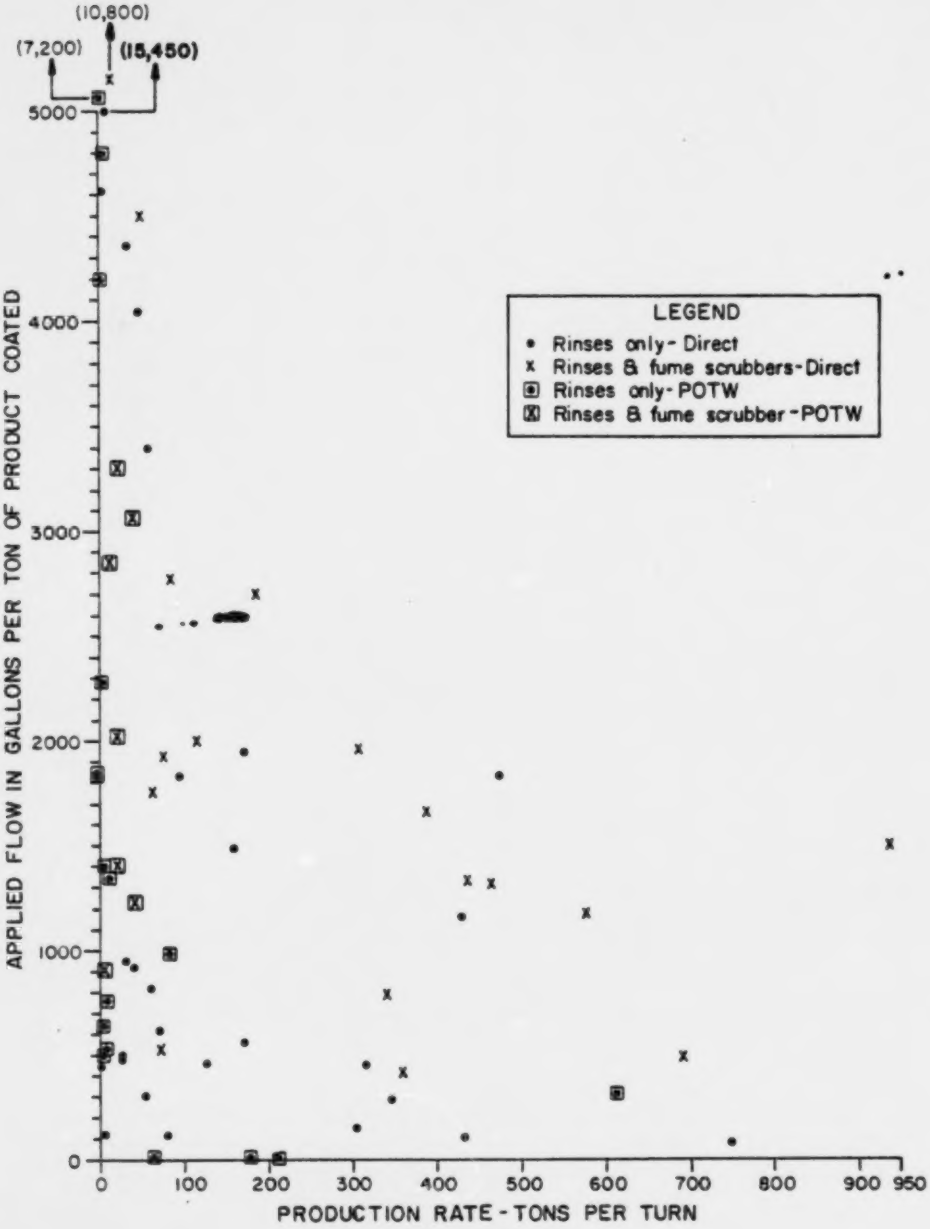
TABLE IV-1

HOT COATING PLANTS THAT HAVE DEMONSTRATED THE ABILITY TO RETROFIT POLLUTION CONTROL EQUIPMENT

Plant Reference Code	Product	Coating Operation	Plant Age (Year)	Treatment Age (Year)
0112B	Strip	Galvanizing	1962	1971
0112G	Fasteners	Galvanizing	✓1930	1973
0112I	Fasteners	Galvanizing	1922	1977
0112I	Fasteners	Aluminizing	1955	1977
0384A	Strip	Galvanizing	1951	1970
0384A	Strip	Aluminizing	1961	1970
0448A	Sheet	Galvanizing	1967	1970
0460A	Wire	Galvanizing	1932	1968
0476A	Wire	Galvanizing	✓1930	1977
0476A	Pipe	Galvanizing	1930	1977
0492A	Pipe	Galvanizing	1962	1976
0580A	Wire Cloth	Galvanizing	1962	1967
0584C	Strip	Galvanizing	1956	1965
0640	Fencing	Galvanizing	1936	1961
0640	Wire	Galvanizing	1936	1961
0856D	Strip	Terne Coating	1964	1978
0856D	Strip	Galvanizing (Al/Zn)	1949	1978



HOT COATING OPERATIONS
APPLIED FLOW vs AGE
FIGURE IV-1



HOT COATING OPERATIONS
APPLIED FLOW vs SIZE
FIGURE IV-2

HOT COATING SUBCATEGORY

SECTION V

WATER USE AND WASTE CHARACTERIZATION

The Agency evaluated process water use and total wastewater volumes based on data from the basic DCP responses received for most domestic hot coating operations. When fume scrubbers were employed, the Agency determined the additional wastewaters attributable to fume scrubber operation. It identified existing wastewater control and treatment technology for each plant, and examined the eventual disposal of wastewater.

Waste characterization is based upon analytical data obtained during the field sampling programs. Additional waste load and water quality data were sought from nine selected companies by detailed data collection portfolios (D-DCPs), which were used to supplement available cost information.

Water use rates discussed below pertain only to process wastewaters, and do not include a consideration of noncontact or nonprocess cooling waters.

Water Use in Hot Coating Operations

Variations in applied water flow rates were noted in Tables III-1 through III-3 for the various hot coating operations. Figures III-1 through III-5 illustrate why such variations are necessary. Note that Figure III-1 (galvanizing) depicts at least eight potential sources of process wastewaters plus at least one source of noncontact cooling water. Total wastewater flow from this line would be quite high. On the other hand, Figure III-3 also depicts a galvanizing operation with only three potential sources, and two of these three are noncontact cooling water. The actual process wastewater flow from this line would be a fraction of the flow from the line shown in Figure III-1, yet both could be producing galvanized ware of comparable size, shape and quantity.

The choice of line configuration is dictated by product requirements, as are the number and nature of the intermediate steps in the process. As the process becomes more complex, the opportunity arises to reduce flows by recycle of a portion of the wastewater, and at the same time recover chemical values from such wastewater. An example appears in Figure III-1, where three consecutive steps in preparing the product for final coating involve the use of alkaline cleaners. Note that wastewater overflows from the hot electrolytic alkaline cleaning tank for reuse in the hot alkaline scrubber, which in turn is reused as makeup to the hot alkaline dip tank. Instead of three separate wastewater discharges from this cleaning step, each contributing objectionable amounts of alkalis and phosphates, a single intermittent discharge occurs. Such flow reduction and chemical conservation techniques can be employed to keep the total process wastewater discharge from even the most complex coating line to a minimum.

The major wastewater flows originating from hot coating operations in the steel industry fall into several distinct groupings:

1. Continuously running dilute rinse waters from rinsing and flushing operations following alkaline or acid cleaning steps; rinses following chemical treatment or surface passivation steps: and, final product rinses after hot dipping. These waters contain suspended and dissolved matter, chlorides, sulfates, phosphates, silicates, oily matter, and varying amounts of dissolved metals (iron, zinc, chromium, lead, tin, aluminum, cadmium) depending on which coating metal is used.

2. More concentrated intermittent discharges, including spent alkaline and acid cleaning solutions, fluxes, chemical treatment solutions, and regenerant solutions from in-line ion exchange systems. These discharges contain higher concentrations of the pollutants noted above. Discharge volumes from these sources can be minimized by close attention to maintenance and operating conditions, and through provision of dragout recovery units whenever possible. Spent cleaning baths are normally collected separately for disposal or treatment, and the plating baths themselves are never discharged. Instead, they are recovered and continuously regenerated as part of the coating operation, or sold to outside contractors for processing and recovery.

3. Fume scrubber wastewaters are produced by continuously scrubbing vapors and mists collected from the cleaning and coating steps. Scrubbers may be once-through or recirculating, and produce wastewaters that may be used as process rinses, since only volatile components are present in the air to be scrubbed. Less than 40 percent of all hot coating lines have wet fume scrubbers. A few plants use dry fume absorbers, but most lines do not provide for any vapor and mist control from coating operations, other than acid tank covers, or fans to divert fumes out of the work area. In many cases the coating line has been designed to minimize the potential for releasing mists and vapors to the air.

4. Noncontact cooling waters are used to control temperatures of the furnaces and molten bath pots associated with coating operations. Except for an increase in temperature, these waters are not contaminated with pollutants during their pass through the coating lines, and thus, require no treatment if they are kept separate from contaminated process waters. Responses for some plants indicate that process and noncontact cooling waters sometimes share a common sewer prior to treatment. Capital investment and annual operating costs are increased unnecessarily due to the larger volumes requiring treatment in such cases. Where possible, flow rates shown in Tables III-1 through III-3, and on Figures IV-1 and IV-2 reflect process wastewaters only. In some instances, plants did not separate process flow data from noncontact flow data, so the flows shown for such plants are high.

Applied Flow Rates

Responses to DCPs were reviewed for applied rinse and fume scrubber flow rates. Separate compilations were made for the various coating metals, and for various final coated products. Data are summarized in Table V-1 in terms of gallons of process water applied per ton of coated product. Wire and its associated products have consistently higher average flow rates than do strip, sheet or miscellaneous shapes. The Agency could not determine whether this is due entirely to rinsing requirements, or to a greater likelihood for wire mills to include noncontact cooling waters in DCP responses. In either case, some wire mills were operating successfully with considerably less water. However, even a comparison of minimum applied flows bears out the fact that wire and related products require more water than strip, sheet or miscellaneous shapes. In addition to surface area, another contributing factor may be that all but one out of 83 wire mills use fluxes, thus increasing the rinsing requirements, while only 20% of the strip and sheet mills use fluxes. For these reasons, the Agency is proposing limitations for wire and related products which are based upon the higher water usage rates observed.

Waste Characterization

The Agency obtained information on wastewater quality from sampling programs at eleven selected hot coating operations, two of which were revisited two years after an initial sampling survey. It also solicited long-term data from nine hot coating operations. A summary of pollutants found in galvanizing, terne-coating and aluminizing operation wastewaters is shown in Tables V-2, V-3 and V-4 respectively.

Note the large variations in the levels of most pollutants. These are due mainly to coating line configuration. For example, lead is used at some plants to anneal products prior to coating, while others do not. If a pickling or rinsing step follows lead annealing, considerable lead may be found in the wastewater. Otherwise, lead is essentially absent except as a contaminant in the zinc metal used for coating. Zinc was found to be essentially absent at several of the galvanizing lines listed. In those cases where zinc content is high in the raw wastewaters, it is often the result of repickling and coating previously galvanized product which failed to pass inspection of the coating following previous passes down the line. Similar findings were noted for chromium and nickel.

Relatively low concentrations of toxic organic pollutants were found in raw wastewaters from all coating operations during the toxic pollutant survey. The phthalates and methylene chloride were universally present but the Agency believes that they are attributable to sampling and analytical techniques. The remaining toxic organics tended to be present in plant intakes at levels equal to or greater than those found in hot coating wastewaters. However, these toxic pollutants appear at levels below treatability except by recycle.

TABLE V-1

PROCESS WATER APPLIED RATES - HOT COATING OPERATIONS

Coating Metal	Type of Product	Rinsewater in gal/ton			Fume Scrubber Water in gal/ton		
		Maximum	Minimum	Avg.	Maximum	Minimum	Avg.
Zinc	All Types	15,540	1.0	1,781	14,520	8.3	1,454
Zinc	Wire, Wire Products, Nails, Fasteners	15,540	447	2,613	14,520	316	2,284
Zinc	Strip & Sheet	3,646	1.0	797	1,319	8.3	350
Zinc	Misc. Shapes	2,270	7.6	683	7,784	145	1,554
Terne	All types: (Strip & Sheet Only)	2,567	301	863	1,280	116	508
Aluminum	All Types	10,800	16	5,408	11,520	11,520	11,520
Aluminum	Wire	10,800	10,800	10,800	11,520	11,520	11,520
Aluminum	Strip	16	16	16	Dry	Dry	Dry
Tin	All Types	7,200	80	1,570	Dry	Dry	Dry
	Wire	7,200	300	1,719	None	None	None
	Strip	80	80	80	Dry	Dry	Dry
Cadmium	Wire Only	2,424	2,424	2,424	None	None	None
Aluminum/ Zinc	All (Sheet Only)	558	461	510	None	None	None
Cadmium/ Zinc	All (Wire Only)	1,832	1,832	1,832	None	None	None
Cadmium/ Tin/Zinc	All (Wire Only)	5,250	5,250	5,250	None	None	None
All Hot Coating	All Types	15,540	1.0	1,828	14,520	8.3	1,547

TABLE V-2

NET RAW WASTEWATERS - HOT COATING GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

TOXIC POLLUTANT SURVEY

Plant Codes	0612		0396A		0948C		0112I		0920E$^{(1)}$		0476A		Average	
	111		112		114		116		118		119			
Sample Point(s)	J$^{(2)}$		D		B		D		C		D		Toxic Survey Only	
Flow, gal/ton	1414		287		211		592		1177$^{(2)(3)}$		147			
Product	Wire		Strip/Sheet		Strip		Fasteners		Strip/Sheet		Pipe			
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	67	0.395	326	0.390	104	0.0914	127	0.313	74	0.363	5	0.00306	117	0.259
Oil and Grease	20	0.118	13	0.0155	208	0.183	16	0.0395	46	0.226	5	0.00306	51	0.0975
Hexavalent Chromium	0.002	0.000012	0.015	0.000018	7	0.00615	0.002	0.000005	0.003	0.000015	0.006	0.000004	1.40	0.00103
pH, units	7.4	-	1.7	-	7.3	-	3.4	-	2.5	-	8.3	-	1.7-7.4	-
Benzene	ND	ND	ND	ND	ND	ND	0.005	0.000012	0.010	0.000049	0.005	0.000003	0.003	0.000011
1,1,1 Trichloroethane	0.067	0.000395	ND	ND	0.010	0.000009	ND	ND	0.003	0.000015	ND	ND	0.013	0.000070
Chloroform	0.015	0.000088	0.010	0.000012	0.010	0.000009	0.011	0.000027	0.074	0.000363	0.068	0.000042	0.031	0.000090
1,3 Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	0.153	0.000750	ND	ND	0.026	0.000125
Fluoranthene	ND	ND	0.024	0.000029	0.010	0.000009	0.005	0.000012	0.015	0.000074	0.005	0.000003	0.010	0.000021
Methylene Chloride	0.115	0.000677	0.012	0.000014	0.016	0.000014	0.018	0.000044	2.50	0.0123	0.010	0.000006	0.445	0.00218
Pentachlorophenol	ND	ND	ND	ND	0.022	0.000019	0.005	0.000012	ND	ND	ND	ND	0.004	0.000005
Bis-(2-ethyl hexyl) phthalate	0.086	0.000506	0.307	0.000367	0.156	0.000137	0.053	0.000131	0.035	0.000172	0.105	0.000064	0.124	0.000229
Butyl benzyl phthalate	ND	ND	0.005	0.000006	0.005	0.000004	0.010	0.000025	0.041	0.000201	0.005	0.000003	0.011	0.000040
Di-n-butyl phthalate	ND	ND	0.047	0.000056	0.026	0.000023	0.020	0.000049	0.031	0.000152	0.010	0.000006	0.022	0.000048
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND	ND	ND	0.057	0.000280	ND	ND	0.010	0.000047
Diethyl phthalate	0.005	0.000029	ND	ND	0.010	0.000009	0.011	0.000027	ND	ND	ND	ND	0.004	0.000011
Dimethyl phthalate	0.005	0.000029	0.010	0.000012	0.010	0.000009	0.005	0.000012	0.019	0.000093	ND	ND	0.008	0.000026
Tetrachloroethylene	0.013	0.000077	0.010	0.000012	0.005	0.000004	0.005	0.000012	0.014	0.000069	ND	ND	0.008	0.000029
Trichloroethylene	0.046	0.000271	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.008	0.000045
Arsenic	NA	NA	0.03	0.000036	NA	NA	NA	NA	0.021	0.000103	NA	NA	0.026	0.000070
Chromium	0.14	0.000824	0.22	0.000263	10	0.00879	0.10	0.000247	2.92	0.0143	<0.025	<0.000015	<2.23	<0.00407
Copper	0.06	0.000353	2.5	0.00299	0.02	0.000018	0.19	0.000468	0.12	0.000589	0.02	0.000012	0.48	0.000738
Cyanide	0.007	0.000041	0.02	0.000024	0.014	0.000012	0.006	0.000015	0.019	0.000093	0.006	0.000004	0.012	0.000031
Lead	0.20	0.00118	25	0.0299	<0.05	<0.000044	0.19	0.000468	#	#	0.41	0.000251	<5.17	<0.00637
Nickel	0.03	0.000177	1.3	0.00155	0.02	0.000018	0.09	0.000222	#	#	<0.02	<0.000012	<0.29	<0.00040
Silver	<0.02	<0.000118	0.05	0.000060	<0.02	<0.000018	<0.02	<0.000049	#	#	<0.02	<0.000012	<0.026	<0.00005
Zinc	3.2	0.0188	50	0.0598	0.6	0.000527	15	0.0370	82.0	0.402	2.7	0.00165	25.6	0.0866
Total Iron	NA	NA	NA	NA	NA	NA	97	0.239	10.5	0.0515	NA	NA	54	0.145
Dissolved Iron	5.0	0.0295	195	0.233	0.04	0.000035	78	0.192	9.0	0.0441	0.03	0.000018	48	0.0831

TABLE V-2
NET RAW WASTEWATERS - HOT COATING GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
PAGE 2

ORIGINAL SURVEY

Plant Code	0856P		0936		0856F		0920E(1)		Average Original Survey Only		Overall Average	
	I-2		V-2		MM-2		MM-2					
Sample Point(s)	4		2+3		4-8,9		3					
Flow, gal/ton	220		1655		699(3)		1233(2)(3)					
Product	Wire		Wire		Sheet		Sheet/Strip					
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	94	0.0862	16	0.110	88	0.256	104	0.534	75	0.247	100	0.254
Oil and Grease	15	0.0138	5	0.0345	48	0.140	20	0.103	22	0.0728	39	0.0876
Hexavalent Chromium	NA	NA	NA	NA	0.003	0.000009	0.011	0.000057	0.007	0.000033	0.177	0.000684
pH, Units	4.5-5.0		1.8-8.7		1.2-11.2		2.6	-	1.2-11.2		1.2-11.2	
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.026	0.000070
Chromium, Total	NA	NA	NA	NA	4.5	0.0131	1.8	0.00925	3.2	0.0112	2.47	0.00585
Copper	NA	NA	NA	NA	0.22	0.000641	0.05	0.000257	0.14	0.000449	0.394	0.000666
Cyanide	NA	NA	NA	NA	0.005	0.000015	0.039	0.000200	0.022	0.000108	0.0145	0.000050
Lead	NA	NA	37.5	0.259	0.10	0.000291	0.26	0.00134	12.6	0.0869	7.96	0.0366
Nickel	NA	NA	NA	NA	0.027	0.000079	0.043	0.000221	0.035	0.000150	0.217	0.000329
Silver	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	<0.026	<0.000050
Zinc	NA	NA	0.3	0.00207	0.2	0.000583	145	0.745	48.5	0.249	33.2	0.141
Total Iron	33	0.0303	1010	6.97	15.4	0.0449	11.6	0.0596	267	1.78	196	0.926
Dissolved Iron	7.1	0.00651	203	1.40	0.043	0.000125	9.0	0.0462	54.8	0.363	50.7	0.195

---

(1) Plant was sampled during both surveys.
(2) Flow includes non-contact cooling waters.
(3) Flow includes fume hood scrubber waters.

ND: Not Detected
NA: Not Analyzed
: Values for determination are qualified as less than some number well over the limit of detection, e.g., <0.6, or <0.25 mg/l

TABLE V-3

NET RAW WASTEWATER - HOT COATING - TERNE
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

	TOXIC POLLUTANT SURVEY		ORIGINAL SURVEY			
Plant Codes	0856D(1) 113		0060 00-2		0856D(1) PP-2	
Sample Point	C		4		2	
Flow, gal/ton	1006(2)(3)		516		2194(2)(3)	
Product	Sheet/Strip		Sheet/Strip		Sheet/Strip	
	mg/l	lbs/1000 lb	mg/l	lbs/1000 lb	mg/l	lb/1000 lb
Suspended Solids	11	0.0461	48	0.103	9	0.0823
Oil and Grease	4	0.0168	13	0.0280	5	0.0457
Tin	<0.4	<0.00168	<2	<0.00430	<2	0.0183
pH	5.2-6.5	---	2.2-4.1	0	3.6-5.2	---
Chloroform	0.053	0.000222	NM	NM	NM	NM
Methylene Chloride	2.50	0.0105	NM	NM	NM	NM
Phenol	0.011	0.000046	NM	NM	NM	NM
Bis-(2-ethyl hexyl) phthalate	0.011	0.000046	NM	NM	NM	NM
Tetrachloroethylene	0.014	0.000059	NM	NM	NM	NM
Chromium	2.68	0.0112	0.03	0.000065	0.17	0.00155
Copper	0.040	0.000168	0.03	0.000065	<0.02	<0.000183
Lead	0.067	0.000281	0.20	0.000430	<0.05	<0.000457
Nickel	0.590	0.00247	0.06	0.000129	0.03	0.000274
Zinc	0.093	0.000390	1.1	0.00237	0.09	0.000823
Iron, Total	12.0	0.0503	109	0.234	20.3	0.186
Iron, Dissolved	4.4	0.0184	74	0.159	14.9	0.136

---

(1) Plant was sampled during both surveys
(2) Flow includes non-contact cooling water
(3) Flow includes fume hood scrubber water
NM: Not measured in original survey

TABLE V-4

NET RAW WASTEWATER - HOT COATING - ALUMINIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

TOXIC POLLUTANT SURVEY

Plant Codes	0112I 116
Sample Point(s)	E
Flow, gal/ton	3882
Product	Fasteners

	mg/l	lbs/1000 lb
Suspended Solids	231	3.74
Oil and Grease	19	0.307
Aluminum	12	0.194
Hexavalent Chromium	0.007	0.000113
pH	8.4	-
Methylene Chloride	0.015	0.000242
Bis-(2-ethyl hexyl) phthalate	0.052	0.000841
Butyl benzyl phthalate	0.060	0.000970
Di-n-butyl phthalate	0.038	0.000614
Diethyl phthalate	0.011	0.000178
Cadmium	<0.01	<0.000162
Chromium	0.10	0.00162
Copper	0.21	0.00340
Lead	0.39	0.00631
Zinc	0.35	0.00566
Nickel	0.18	0.00291
Iron, Total	49	0.793
Iron, Dissolved	NM	NM

NM: Not measured, pH is sufficiently high to eliminate need for analysis of dissolved iron.

HOT COATING SUBCATEGORY

SECTION VI

WASTEWATER POLLUTANTS

For hot coating operations, the pollutants of interest originally limited were oil and grease, suspended solids, lead, chromium (total and hexavalent), tin, zinc, and pH. As a result of the toxic pollutant survey and the addition of other hot coating operations besides galvanizing and terne coating, other pollutants, (e.g. aluminum, cadmium, copper, dissolved iron and nickel) have been considered as possible additions to the list of selected pollutants in certain hot coating alternative treatment systems. The Agency found other pollutants to be present in significant quantities in hot coating wastewaters (e.g., chlorides, sulfates, dissolved solids), but is not proposing limitations for them. In general, these pollutants are nontoxic in nature and difficult to remove. Treatment for these pollutants is not commonly practiced in any industry.

Raw wastewater quality and treated effluent characteristics are described in detail in Sections V and VII. Refer to Tables V-2 and VII-2 for galvanizing, Tables V-3 and VII-3 for terne coating, and Tables V-4 and VII-4 for aluminizing.

Conventional Pollutants

The Agency originally promulgated limitations for suspended solids, oil and grease and pH in 1976. Suspended solids not only are routinely present in raw wastewaters, but also are generated during treatment as dissolved metals are precipitated out of solution. Thus, effective removal of suspended solids is necessary to minimize the discharge of toxic metal pollutants.

Oil and grease was selected for limitation because of the use of lubricants and oil baths in the hot coating processes. Sampling indicated the presence of up to 200 mg/l of oil and grease.

Finally pH was chosen primarily because of the detrimental effect of extremes in pH levels, and because control of pH significantly affects the removal of dissolved metals. Without such control, unacceptable discharges of toxic metals could occur.

These pollutants are common to all hot coating operations. Thus, effluent limitations for these pollutants are being proposed at the BPT and BCT levels.

Toxic Pollutants

Analytical results for 51 toxic pollutants found in raw and treated wastewaters are summarized in Table VI-1 through VI-3. Thirty-eight different toxic organics were identified as present and quantified at the seven hot coating plants sampled for priority pollutants, although only about half that number were identified at any single plant. Fifteen of the thirty-eight pollutants were found at only one of the plants, usually at concentrations less than 0.01 mg/l. Eleven of the thirty-eight organic pollutants were found in excess of 0.01 mg/l in either raw or treated hot coating wastewaters, and one, methylene chloride, is believed to be an artifact. In treated effluents, methylene chloride, chloroform, 1,1,1 trichloroethane and 4,6-dinitro-o-cresol were found in excess of 0.01 mg/l, with only methylene chloride exceeding 0.05 mg/l. Phthalates were also found universally where automatic samplers were used to collect samples indicating a problem with leaching of plastic tubing plasticizers into the sample.

Of the 130 different pollutants listed as toxics, 50 (excluding methylene chloride) have been found to be present in measurable concentrations in raw wastewater or treated effluent from the seven plants surveyed during the toxic pollutant survey of this subcategory. Not all of the 50 pollutants are directly related to the plant operations. As many as 28 have been identified in the water used as makeup at the surveyed plants, although concentrations tend to be less than 10 micrograms per liter for most pollutants in the intake waters tested.

No definite source was ascribed to the organic priority pollutants found in wastewater from hot coating operations. Residual oils applied during cold rolling operations prior to coating is one possible source of low level contamination of coating wastewaters by so many different organics. Trichloroethylene, tetrachloroethylene, and 1,1,1 trichloroethane may be present in the degreasing solvent used as a cleaner prior to coating. Toxic metal pollutants are more directly related to the coating operations. Not only are certain toxic metals like zinc, cadmium, lead, and chromium used in the hot dipped coating processes, but most of the other toxic pollutant metals are also found as trace contaminants in the baths associated with hot coating. Cadmium, chromium, copper, lead, nickel, and zinc were found in raw and treated wastewater from all hot coating operations. Most concentrations were reduced to a considerable extent by treatment, with zinc proving to be the most difficult to treat.

The treatment systems used at these hot coating plants were not designed to control and treat more than about a dozen of the 130 toxic pollutants listed; however, most plants show some reduction of the quantity of pollutants found in their wastewaters. Toxic organics in effluents were incidentally treated along with other pollutants to levels for which no specific organic removal step is practical other than recycle. Toxic metal removal was also accomplished to low levels through the use of precipitation, flocculation, and sedimentation (or filtration). As a result, the Agency believes that an acceptable control of the various toxic wastewater pollutants from hot coating operations can be achieved by establishing limitations on a relatively small number of indicator pollutants. For a summary of pollutants selected for limitation, refer to Table VI-4.

Data are also available for a variety of nontoxic pollutants for which limitations are not being proposed. These pollutants were measured to enable evaluation of factors such as scale formation and corrosion where recycle of wastewater is considered, and to aid in evaluation of chemical treatment costs and sludge loads. Additional measurements in hot coating operations included acidity/alkalinity, calcium, chloride, iron, solids (dissolved), and sulfate.

TABLE VI-1

TOXIC POLLUTANTS IN HOT COATING - GALVANIZING WASTEWATERS

(All concentrations in mg/l)

	Toxic Pollutants	111		112		114		116		118		119	
	Organics	Raw	Trt.*	Raw	Trt.*	Raw	Trt.*	Raw	Trt.*	Raw	Trt.	Raw	Trt.*
1	Acenaphthene	ND	0.005	ND	0.005	ND	0.005	0.005	ND	ND	0.003	ND	0.005
4	Benzene	ND	0.005	ND	0.005	ND	0.010	0.005	ND	0.011	0.007	0.005	ND
11	1,1,1-Trichloroethane	0.067	ND	ND	ND	0.010	0.032	ND	ND	ND	ND	ND	0.005
20	2-Chloronaphthalene	ND	ND	ND	0.005	ND	ND	ND	ND	ND	0.003	ND	ND
21	2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	0.005	0.005	ND	ND	ND	0.010	ND
23	Chloroform	0.015	0.005	0.010	0.010	0.010	0.019	0.012	0.010	0.106	0.048	0.069	0.014
24	2-Chlorophenol	ND	ND	0.005	ND	ND	0.005	ND	ND	ND	0.003	0.010	ND
26	1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	0.144	ND	ND	ND
30	1,2-trans-dichloroethylene	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
31	2,4-Dichlorophenol	0.005	0.010	ND	ND	0.005	ND	0.005	ND	ND	ND	ND	ND
39	Fluoranthene	ND	0.010	0.024	0.010	0.010	0.010	0.005	0.005	ND	0.007	0.005	0.005
44	Methylene chloride	0.115	0.021	0.013	0.013	0.016	0.230	0.018	0.010	ND	ND	0.010	0.011
48	Dichlorobromomethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.010	ND
55	Naphthalene	ND	ND	ND	0.010	ND	0.010	ND	ND	ND	ND	ND	ND
57	2-Nitrophenol	ND	ND	ND	ND	ND	0.005	ND	0.005	ND	ND	ND	ND
59	4,6-Dinitrophenol	ND	ND	ND	ND	ND	0.005	0.005	ND	ND	ND	ND	ND
60	4,6-Dinitro-o-cresol	ND	ND	ND	0.020	ND	ND	ND	ND	ND	0.003	ND	ND
64	Pentachlorophenol	ND	0.005	ND	ND	0.022	0.005	0.005	ND	ND	0.003	ND	ND
65	Phenol	ND	ND	ND	0.010	ND	0.005	0.005	ND	ND	ND	ND	ND
72	Benzo(a)anthracene	ND	ND	ND	ND	ND	ND	ND	0.005	ND	ND	ND	ND
73	Benzo(a)pyrene	ND	0.010	ND	0.005	ND	0.005	ND	ND	ND	0.003	ND	ND
76	Chrysene	ND	ND	ND	ND	ND	ND	ND	0.005	ND	ND	ND	ND
77	Acenaphthylene	ND	0.005	ND	0.010	0.010	0.010	ND	ND	ND	0.003	ND	0.005
78	Anthracene	ND	ND	ND	ND	ND	ND	ND	ND	0.005	0.007	ND	ND
80	Fluorene	0.005	ND	ND	0.005	ND	0.010	0.010	ND	ND	0.003	ND	0.005
81	Phenanthrene	ND	ND	ND	ND	ND	ND	ND	ND	0.005	0.007	ND	ND
84	Pyrene	0.005	0.010	0.021	ND	0.010	0.010	0.005	0.005	ND	0.007	0.005	0.005
85	Tetrachloroethylene	0.014	ND	0.010	ND	0.005	0.005	0.006	ND	0.017	0.008	ND	ND
86	Toluene	ND	ND	ND	0.005	0.005	0.010	ND	ND	0.010	0.010	ND	ND
87	Trichloroethylene	0.046	0.010	ND	ND	ND	ND	ND	ND	ND	0.003	ND	ND
	Nonorganics												
114	Antimony	NA	NA	NA	NA	NA	NA	NA	NA	0.003	0.003	NA	NA
115	Arsenic	NA	NA	0.04	0.010	0.010	0.010	NA	NA	0.014	0.007	NA	NA
117	Beryllium	NA	NA	NA	NA	NA	NA	NA	NA	<0.02	<0.02	NA	NA
118	Cadmium	0.010	0.02	0.020	<0.02	<0.02	<0.02	0.010	0.010	<0.2	<0.2	0.010	0.010
119	Chromium	0.15	0.04	0.23	0.15	10.2	0.02	0.10	<0.03	2.32	0.20	<0.02	<0.02
120	Copper	0.06	0.03	2.5	0.17	0.02	<0.02	0.20	0.020	0.120	<0.04	0.020	0.03
121	Cyanide	0.008	0.021	0.018	0.002	0.014	0.008	0.006	0.002	0.019	0.014	0.006	0.012
122	Lead	0.20	0.19	25	0.58	<0.05	<0.05	0.19	0.10	<0.50	<0.60	0.42	<0.10
123	Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
124	Nickel	0.03	0.03	1.3	0.27	0.03	0.04	0.09	0.03	<0.50	<0.50	<0.02	0.030
125	Selenium	NA	NA	<0.01	0.010	<0.010	0.010	NA	NA	0.005	0.012	NA	NA
126	Silver	<0.02	0.02	0.06	0.09	<0.02	<0.02	<0.02	<0.02	<0.25	<0.25	<0.02	<0.02
127	Thallium	NA	NA	NA	NA	NA	NA	NA	NA	<0.05	<0.05	NA	NA
128	Zinc	3.2	0.13	50	0.25	0.65	0.07	15	0.13	88.9	7.7	2.8	0.06

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*: Indicates water quality of central treatment effluent

NA: Not Analyzed
ND: None Detected

TABLE VI-2

TOXIC POLLUTANTS IN HOT COATING - TERNE COATING WASTEWATERS

(All concentrations in mg/l)

Toxic Pollutants Organics	113 Raw
1 Acenaphthene	0.003
4 Benzene	0.007
11 1,1,1-Trichloroethane	0.003
21 2,4,6-Trichlorophenol	0.003
22 Parachlorometacresol	0.003
23 Chloroform	0.053
29 1,1-Dichloroethylene	0.003
30 1,2-Trans-dichloroethylene	0.009
31 2,4-Dichlorophenol	0.003
35 2,4-Dinitrotoluene	0.003
36 2,6-Dinitrotoulene	0.003
38 Ethylbenzene	0.003
39 Fluoranthene	0.007
44 Methylene chloride	0.833
54 Isophorone	0.003
64 Pentachlorophenol	0.007
65 Phenol	0.011
73 Benzo(a)pyrene	0.003
74 3,4-Benzofluoranthene	0.003
75 Benzo(k)fluoranthene	0.003
76 Chrysene	0.007
78 Anthracene	0.007
80 Fluorene	0.003
81 Phenanthrene	0.007
84 Pyrene	0.007
85 Tetrachloroethylene	0.014
86 Toluene	0.007
Nonorganics	
114 Antimony	<0.006
115 Arsenic	<0.002
117 Beryllium	<0.008
118 Cadmium	<0.080
119 Chromium	2.675
120 Copper	0.040
121 Cyanide	0.003
122 Lead	<0.067
123 Mercury	0.0007
124 Nickel	<0.230
125 Selenium	<0.002
126 Silver	<0.025
127 Thallium	<0.050
128 Zinc	0.093

NOTE: Plants' wastewater treatment under construction at time of sampling. Raw wastewater sample was the only one available.

TABLE VI-3

TOXIC POLLUTANTS IN HOT COATING - ALUMINIZING WASTEWATERS

(All concentrations in mg/l)

Toxic Pollutants Organics	116 Raw	116 Treated*
23 Chloroform	0.010	0.010
39 Fluoranthene	0.005	0.005
44 Methylene Chloride	0.015	0.010
60 4,6-Dinitro-o-cresol	0.006	ND
64 Pentachlorophenol	0.005	ND
73 Benzo (a) Pyrene	0.005	ND
77 Acenaphthylene	0.005	ND
84 Pyrene	0.005	0.005
85 Tetrachlorethylene	0.005	ND
Nonorganics		
114 Antimony	NA	NA
115 Arsenic	NA	NA
117 Beryllium	NA	NA
118 Cadmium	1.010	0.010
119 Chromium	0.13	<0.03
120 Copper	0.22	0.02
121 Cyanide	0.002	0.002
122 Lead	0.40	0.10
123 Mercury	NA	NA
124 Nickel	0.18	0.03
125 Selenium	NA	NA
126 Silver	<0.02	<0.02
127 Thallium	NA	NA
128 Zinc	0.36	0.13

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*: Indicates water quality of central treatment effluent
NA: Not analyzed
ND: Not detected

TABLE VI-4

SELECTED POLLUTANT PARAMETERS
HOT COATING OPERATIONS

	Galvanizing			Terne Coating			Other Metal Coatings		
	BPT	BCT	BAT	BPT	BCT	BAT	BPT	BCT	BAT
Total Suspended Solids	X	X		X	X		X	X	
Oils and Greases	X	X		X	X		X	X	
pH, Units	X	X		X	X		X	X	
Chromium, total	X		X			X	X		X
Chromium, hexavalent	X						X		
Cadmium, total							X(1)		X(1)
Zinc, total	X		X			X			X
Tin, total				X					
Lead, total			X	X		X			X

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(1) Limitation only applies to operations where cadmium is used as a coating metal.
X: Selected pollutant parameter.

HOT COATING SUBCATEGORY

SECTION VII

CONTROL AND TREATMENT TECHNOLOGY

A brief summary of the treatment practices employed at hot coating operations visited by the Agency shows the variety of wastewater treatment techniques employed in the industry. Also included are descriptions of the potential applications of other technologies, and more detailed discussions of technologies useful to treat or control specific pollutants. A standard list identifying all technologies observed throughout the industry is shown as Table VII-1, which also serves as a key to abbreviations and symbols used.

In developing the alternative treatment systems, limitations and incremental costs, the Agency considered the level of existing wastewater treatment for most plants. The alternative treatment systems were then formulated in an "add-on" fashion to these basic levels. The various treatment systems (levels of treatment) are summarized in Section VIII in Tables VIII-4 through VIII-6 for technology and Tables VIII-7 through VIII-19 for costs.

Summary of Treatment Practices Currently Employed for Hot Coating Operations

As noted previously, the process wastewaters generated during hot coating operations include alkaline and acidic cleaners and rinses, fume scrubbing wastewaters, and chemical treatment solutions and rinses. Wastewaters are often treated in central treatment systems along with wastewaters from other forming and finishing opreations. DCP data indicate that more than 75% of all hot coating wastewaters are treated jointly with wastewaters from pickling, cold rolling, hot forming, and other finishing operations. Most of the remaining 25%, provide some degree of separate treatment for hot coating lines, prior to central treatment used for further polishing.

The more common hot coating treatment practices are listed below according to the degree of treatment they provided:

1. No matter what wastewater treatment technique is used, an important first step is to minimize the quantity of wastewaters requiring treatment. This is accomplished by providing dragout recovery tanks downstream of the main cleaning tanks; by employing high pressure spray rinses with recycling or reuse of rinsewaters; and by careful, even critical, attention to maintenance of equipment such as rolls and squeegees designed to reduce solution losses. Some hot coating lines with slower line speeds minimize carryover of wastes so effectively that no treatment of wastewaters is practiced. Spent pickling and cleaning solutions at these plants are collected separately for disposal via contract hauling, or deep wells.

Cascade rinse systems and recycle of fume hood scrubber wastes are two effective methods of minimizing wastewater volumes requiring treatment.

2. The simplest "treatment" of wastewaters from hot coating operations usually begins with blending acidic and alkaline wastes, then providing space and time for suspended precipitates to settle. This blending of wastewaters is practiced at 12% of hot coating plants. Oily matter breaks out of solution, becoming susceptible to removal by either skimming or through adherence to the settleable solids. To avoid slugs of extremely acidic or alkaline wastewaters, concentrated solutions are collected separately, stored, and then allowed to combine with rinses gradually to provide the best mixing conditions possible in this relatively crude system.

3. A significant improvement in treatment technology is attained through controlled neutralization of the combined wastewaters, using an alkaline material such as lime, ammonia, or caustic soda to achieve higher pH levels than is normally possible through simply blending the wastewaters. Three-fourths of the existing hot coating operations use this technology currently. A polymer is also used at 40% of all hot coating wastewater treatment plants to enhance settling characteristics, and flocculator-clarifiers are installed at 60% of the operations to efficiently handle the large volumes of metal hydroxides which precipitate out. Sludges are sometimes dewatered using vacuum filters (by 18% of the plants) and are then transferred to landfill areas. Wet sludges are landfilled or lagooned at many hot coating operations.

4. Other treatment methods depend upon the source of the wastewaters. These are tailored to specific needs, for example:

   Reduction of Hexavalent Chromium - Galvanizing and other metallic coating operations producing wastewaters contaminated with chromate or dichromate ions have separate pretreatment stages to reduce toxic Cr^{+6} to Cr^{+3} prior to neutralization. Most often, pickling rinse solutions or spent pickle liquors are blended with the chromium wastewaters to acidify the wastewaters and provide the required reductant. In some cases, (9% of the galvanizing wastewater treatment plants) additional reducing agents such as bisulphites or sulfur dioxide gases are used in place of or in addition to pickling wastes. The reduced chromium containing wastes are then passed along to a controlled neutralization treatment stage, where the addition of lime, ammonia, or caustic soda precipitates all chromium as hydroxide. Alternatively, the chromates may be precipitated out of solutions by the addition of barium salts, such as sulfates or carbonates. A precipitate of barium chromate is separated out for subsequent recovery of barium and chromium. Also, ion exchange techniques have been utilized at several coating lines to recover clean chromic acid from strong solutions contaminated by iron and trivalent chromium. The recovered acid is reused in the coating or chemical treatment operations.

Precipitation of Aluminum, Cadmium, Copper, Lead, Tin, and Other Metals - As described previously in Section VI, the sources of these metallic pollutants in hot coating operations are the cleaning and pickling of the steel prior to application of coatings, the rinsing or quenching of the product after the coatings have been applied, and in the disposal of spent coatings solutions. They can be found in the spent pickle liquors and in the rinse water following the pickling and coating operations. The wastewaters are generally acidic in nature, and so the wastewater treatment is focused on the neutralization of the acid with subsequent precipitation of dissolved metals as hydroxides or as sulfides.

Hydrated lime, ammonia, or caustic soda is used to raise the pH of the wastewaters to 8.5-9.0. At this pH, metal hydroxides are precipitated and can be settled out. This treatment sequence is very common in this industry, and in fact, 75% of all hot coating wastewaters undergo alkaline precipitation. The pH must be controlled within a narrow range to prevent resolubilizing certain metals. An improved heavy metal precipitation step has been used in the metal finishing industry, and is considered applicable to similar wastewaters from coating operations. The treatment procedure involves the addition of soluble sulfides (such as sodium sulfide or sodium hydrosulfide) or a freshly prepared ferrous sulfide slurry (prepared by reacting ferrous sulfate with sodium hydrosulfide) to form insoluble metal sulfides which can be separated prior to discharge. Although this system shows considerable promise of attaining lower heavy metal concentrations than achievable by hydroxide precipitation alone, it remains to be demonstrated on hot coating wastewaters. Since most of the components are similar to the hydroxide precipitation sequence, the sulfide treatment can serve as a backup polishing system following conventional lime or caustic soda treatment.

Ferrous iron is also present in wastewaters generated during coating operations. Aeration, with subsequent neutralization is currently the most widely used method for treating ferrous iron in the dilute rinse waters resulting from the hot coating operation. This is usually done in a rapid mixing tank where the pH of the wastewater is adjusted to 8.5 with lime. The treated waste is then pumped to a clarifier, thickener or settling lagoon where the precipitated iron in the hydroxide form settles out along with other metal hydroxide precipitates. In a properly designed and operated treatment plant, the dissolved iron in the discharge from the sedimentation unit should be significantly less than 1 mg/l.

Oil and Grease - The removal of oil and grease from wastewaters can be effected by the following techniques used either alone or in a combination with each other, depending on the nature of the wastewater.

Gravity Separation - With the exception of filtration, free oil removal processes are based on density separation. The process is applicable to the removal of both floatable substances (i.e., free oil and greases, fine oil-coated solids, water-oil emulsions), and heavier-than-water materials, such as the larger oil-coated metal and oxide particles. The choice of a particular type of separator would be determined by the type of wastewater encountered, and could range from the simplest separator in which only floatable substances are removed to the more complex dual function scale pits and clarifiers (with or without chemical treatment) in which both the floatable and nonfloatable phases are removed. Currently, slightly more than half of the hot coating wastewater treatment plants utilize surface skimmers to remove floating oil.

Suspended Solids - Suspended solids in the hot coating subcategory for the most part consist of metals removed during pickling, cleaning and rinsing, and metal hydroxides generated during lime neutralization of wastewaters containing of dissolved metals. Suspended solids are usually treated by gravity techniques. For the most part, (60% of the plants) treatment has been confined to the use of clarifiers or thickeners which, when provided with appropriate organic flocculant aids, achieve excellent solids separations. Forty percent of the treatment systems include polymer addition. About 21 percent of the plants remove the suspended solids by filtration.

5. Joint treatment systems combining wastewaters from many different sources into one terminal treatment operation are common in integrated steel mills and in the larger forming and finishing mills. In these systems, wastewaters from hot coating lines usually represent a minor portion of the total flow, notably when hot forming wastes are present. Such terminal treatment systems may incorporate any or all of the individual treatment stages mentioned above prior to mixing with other wastewaters. At some plants all wastewaters are combined before treatment commences. This results in dilution of the wastes and reduces the effectiveness of subsequent treatment. The only way to be certain that such loads are in fact reduced is to provide pretreatment prior to mixing with other wastewaters.

Plant Visits

Visits were made to eleven plants to study the individual operations included in the hot coating subcategory. Tables VII-2 through VII-4 present the treated effluent waste loads from these plants.

Plant I-2 - Figure VII-1

Wire galvanizing wastewaters are treated by dilution and reaction with other mill wastes in a terminal lagoon, with subsequent discharge to a receiving stream.

Plant V-2 - Figure VII-2

Wastewaters from wire hot coating and pickling, are combined and neutralized with caustic soda prior to discharge to a POTW.

Plant MM-2 - Figure VII-3

Hot and cold strip/sheet coating wastewaters are combined with wastewaters from other sources. Treatment includes equalization, oil separation, aeration, sedimentation, lagooning, and recirculation to service water with intermittent blowdown to the river.

Plant NN-2 - Figure VII-4

This plant uses equalization, mixing, two-stage lime addition, polymer feed, and clarification for treatment of batch and continuous galvanizing wastewaters from strip, sheet and miscellaneous shape production lines. Clarifier underflows are vacuum filtered then used as landfill. Overflows are discharged to a receiving stream.

Plant OO-2 - Figure VII-5

This plant uses mixing and dilution of rinsewaters from terne coating of strip/sheet prior to discharge. Solution dragout is minimized through strict attention to maintenance of equipment.

Plant PP-2 - Figure VII-6

This plant uses mixing and dilution of rinsewaters from terne coating of strip/sheet prior to river discharge. Solution dragout is minimized through strict attention to maintenance of equipment.

Plant 111 - Figure VII-7

Wiper waters from wire galvanizing operations are collected, recycled via hot rolling mills, with a small continuous bleed-off to treatment. Pickling rinses and spent HCl concentrates are combined with wastes from nail and fence galvanizing, treated with lime, aeration, clarification, and pressure filtration through sand prior to discharge.

Plant 112 - Figure VII-8

Wastewaters from continuous galvanizing are combined with pickling concentrates and rinses, treated with lime and polymer, clarified, and discharged to a POTW.

Plant 113 - Figure VII-9

During the toxic survey (March, 1977), wastewaters from this continuous strip/sheet terne coating line were discharged without treatment. A combined chemical treatment plant is under construction. Meanwhile, solution dragout is minimized through strict attention to maintenance of equipment.

Plant 114 - Figure VII-10

Galvanizing wastewaters from continuous strip/sheet coating lines are blended with wastes from pickling, cold rolling, and electrolytic coating lines, equalized, treated with lime, settled, skimmed free of oils, treated with polymer, clarified and discharged.

Plant 116 - Figure VII-11

Wastewaters from galvanizing, aluminizing, electrolytic coating, and alkaline degreasing of wire, fasteners, and special shapes, are combined, treated with lime and polymer, clarified, filtered and stored in a large lagoon for reuse or discharge.

Plant 118 - Figure VII-12

Spent galvanizing solutions, rinsewater, fume scrubber water and some noncontact cooling water from continuous strip/sheet and batch miscellaneous shape coating lines, are blended, treated with lime in two stages, fed polymer, clarified and discharged once-through. Clarifier underflows are vacuum filtered.

Plant 119 - Figure VII-13

Wastewaters from pipe and tube pickling and galvanizing are combined with wastewaters from other plant sources, equalized, skimmed free of oil, aerated, treated with lime and polymer, clarified and discharged.

TABLE VII-1

OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS

Symbols

A. Operating Modes

1. OT Once-Through

2. Rt,s,n Recycle, where t = type waste
s = stream recycled
n = % recycled

t: U = Untreated
T = Treated

	s	n
P	Process Wastewater	% of raw waste flow
F	Flume Only	% of raw waste flow
S	Flume and Sprays	% of raw waste flow
FC	Final Cooler	% of FC flow
BC	Barometric Cond.	% of BC flow
VS	Abs. Vent Scrub.	% of VS flow
FH	Fume Hood Scrub.	% of FH flow

3. REt,n Reuse, where t = type
n = % of raw waste flow

t: U = before treatment
T = after treatment

4. BDn Blowdown, where n = discharge as % of raw waste flow

B. Control Technology

10. DI Deionization

11. SR Spray/Fog Rinse

12. CC Countercurrent Rinse

13. DR Drag-out Recovery

C. Disposal Methods

20. H Haul Off-Site

21. DW Deep Well Injection

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 2

C. Disposal Methods (cont.)

22.	Qt,d	Coke Quenching, where t = type d = discharge as % of makeup t: DW = Dirty Water CW = Clean Water
23.	EME	Evaporation, Multiple Effect
24.	ES	Evaporation on Slag
25.	EVC	Evaporation, Vapor Compression Distillation

D. Treatment Technology

30.	SC	Segregated Collection
31.	E	Equalization/Blending
32.	Scr	Screening
33.	OB	Oil Collecting Baffle
34.	SS	Surface Skimming (oil, etc.)
35.	PSP	Primary Scale Pit
36.	SSP	Secondary Scale Pit
37.	EB	Emulsion Breaking
38.	A	Acidification
39.	AO	Air Oxidation
40.	GF	Gas Flotation
41.	M	Mixing
42.	Nt	Neutralization, where t = type t: L = Lime C = Caustic A = Acid W = Wastes O = Other, footnote

D. Treatment Technology (cont.)

43.	FLt	Flocculation, where t = type

t: L = Lime
A = Alum
P = Polymer
M = Magnetic
O = Other, footnote

44.	CY	Cyclone/Centrifuge/Classifier
44a.	DT	Drag Tank
45.	CL	Clarifier
46.	T	Thickener
47.	TP	Tube/Plate Settler
48.	SLn	Settling Lagoon, where n = days of retention time
49.	BL	Bottom Liner
50.	VF	Vacuum Filtration (of e.g., CL, T, or TP underflows)
51.	Ft,m,h	Filtration, where t = type m = media h = head

t	m	h
D = Deep Bed	S = Sand	G = Gravity
F = Flat Bed	O = Other, footnote	P = Pressure

52.	CLt	Chlorination, where t = type

t: A = Alkaline
B = Breakpoint

53.	CO	Chemical Oxidation (other than CLA or CLB)

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT TECHNOLOGIES AND DISPOSAL METHODS
PAGE 4

D. Treatment Technology (cont.)

54. BOt — Biological Oxidation, where t = type

    t: An = Activated Sludge
    n = No. of Stages
    T = Trickling Filter
    B = Biodisc
    O = Other, footnote

55. CR — Chemical Reduction (e.g., chromium)

56. DP — Dephenolizer

57. ASt — Ammonia Stripping, where t = type

    t: F = Free
    L = Lime
    C = Caustic

58. APt — Ammonia Product, where t = type

    t: S = Sulfate
    N = Nitric Acid
    A = Anhydrous
    P = Phosphate
    H = Hydroxide
    O = Other, footnote

59. DSt — Desulfurization, where t = type

    t: Q = Qualifying
    N = Nonqualifying

60. CT — Cooling Tower

61. AR — Acid Regeneration

62. AU — Acid Recovery and Reuse

63. ACt — Activated Carbon, where t = type

    t: P = Powdered
    G = Granular

64. IX — Ion Exchange

65. RO — Reverse Osmosis

66. D — Distillation

TABLE VII-1
OPERATING MODES, CONTROL AND TREATMENT
TECHNOLOGIES AND DISPOSAL METHODS
PAGE 5

D. Treatment Technology (cont.)

67.	AA1	Activated Alumina
68.	OZ	Ozonation
69.	UV	Ultraviolet Radiation
70.	CNTt,n	Central Treatment, where t = type n = process flow as % of total flow t: 1 = Same Subcats. 2 = Similar Subcats. 3 = Synergistic Subcats. 4 = Cooling Water 5 = Incompatible Subcats.
71.	On	Other, where n = Footnote number
72.	SB	Settling Basin
73.	AE	Aeration
74.	PS	Precipitation with Sulfide

TABLE VII-2

EFFLUENT WASTE LOADS - HOT COATING - GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

A. Toxic Pollutant Survey

	Plant Codes	0612		0396A		0948C		01121		0920E		0476A	
		111		112		114		116		118		119	
	Sample Points	(J/B+C+D+E)H		(D/B+E+D+J)H		(B/G)H		(D/F+B)H		D		(D/E)G	
	Flow, gal/ton	1414		287		211		592		1177		147	
	C&TT	NL,CL,FDSP		AE,NL,FLP,CL,VF,POTW		NL,FLP,T,SS		NL,FLP,T,FDSP		NL,FLP,T,VF		SS,NL,FLP,CL,VF	
		mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
	Suspended Solids	11	0.0649	43	0.0514	6	0.00528	1.1	0.00272	37	0.181	4	0.00245
	Oils and Greases	4	0.0236	6	0.00718	6	0.00528	4	0.00987	5	0.0245	11	0.00674
	Chromium +6	0.006	0.000035	0.005	0.000006	0.006	0.000005	0.003	0.000007	0.077	0.000378	0.008	0.000005
	pH, Units	8.4	-	9.0	-	7.7	-	7.5	-	8.9	-	7.8	-
4	Benzene	0.005	0.000029	ND	ND	0.010	0.000009	ND	ND	0.007	0.000034	ND	ND
11	1,1,1-Trichloroethane	ND	ND	ND	ND	0.032	0.000028	ND	ND	ND	ND	0.005	0.000003
23	Chloroform	0.005	0.000029	0.010	0.000012	0.018	0.000016	0.010	0.000025	0.048	0.000236	0.014	0.000009
26	1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
39	Fluoranthene	0.010	0.000059	0.010	0.000012	0.010	0.000009	0.005	0.000012	0.007	0.000034	0.010	0.000006
44	Methylene Chloride*	0.021	0.000124	0.013	0.000016	0.230	0.000202	0.010	0.000025	<0.010	<0.00005	0.011	0.000007
64	Pentachlorophenol	0.005	0.000029	ND	ND	0.005	0.000004	ND	ND	0.003	0.000015	ND	ND
66	Bis(2-ethylhexyl)phthalate*	0.130	0.000766	0.104	0.000124	0.062	0.000055	0.010	0.000025	0.012	0.000059	0.150	0.000092
67	Butylbenzyl phthalate*	ND	ND	0.005	0.000006	0.005	0.000004	0.005	0.000012	0.007	0.000034	ND	ND
68	Di-n-butyl phthalate*	0.018	0.000106	0.010	0.000012	0.010	0.000009	0.010	0.000025	0.007	0.000034	0.013	0.000008
69	Di-n-octyl phthalate*	ND	ND	ND	ND	ND	ND	ND	ND	0.003	0.000015	ND	ND
70	Diethyl phthalate*	0.010	0.000059	0.005	0.000006	0.010	0.000009	0.005	0.000012	ND	ND	ND	ND
71	Dimethyl phthalate*	0.005	0.000029	0.007	0.000008	0.010	0.000009	ND	ND	0.003	0.000005	0.010	0.000006
85	Tetrachloroethylene	ND	ND	ND	ND	0.005	0.000004	ND	ND	0.008	0.000039	ND	ND
87	Trichloroethylene	0.010	0.000059	ND	ND	ND	ND	ND	ND	0.003	0.000015	ND	ND
115	Arsenic	NA	NA	0.01	0.000012	0.01	0.000009	NA	NA	0.007	0.000034	NA	NA
119	Chromium	0.04	0.000236	0.07	0.000084	0.02	0.000018	0.03	0.000075	0.27	0.00132	0.025	0.000015
120	Copper	0.03	0.000177	0.17	0.000203	<0.02	<0.000018	0.02	0.000049	<0.04	<0.000196	0.03	0.000018
121	Cyanide	0.021	0.000124	0.002	0.000002	0.007	0.000006	0.001	0.000002	0.014	0.000069	0.012	0.000007
122	Lead	0.18	0.00106	0.57	0.000682	0.005	0.000044	0.10	0.000247	#	ISD	0.10	0.000061
124	Nickel	0.02	0.000118	0.27	0.000323	0.04	0.000035	0.03	0.000074	7.75	0.0380	0.03	0.000018
126	Silver	0.02	0.000118	0.09	0.000108	#	ISD	#	ISD	#	ISD	#	ISD
128	Zinc	0.12	0.000707	0.24	0.000287	0.07	0.000062	0.13	0.000321	6.73	0.0330	0.05	0.000031

TABLE VII-2
EFFLUENT WASTE LOADS - HOT COATING - GALVANIZING
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS
PAGE 2

B. Original Guidelines Survey

Plant Codes	0856P		0936		0856F		0920E	
	I-2		V-2		MM-2		NN-2	
Sample Points	5		4		6		4	
Flow. gal/ton	220		1655		699		1233	
C&TT	SL		NC;POTW		CR,NL,FLP,CL,SS		NL,FLP,T,VF	
	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs	mg/l	lbs/1000 lbs
Suspended Solids	39	0.0358	276	1.91	60	0.175	6	0.0308
Oils and Greases	14	0.0128	9.3	0.0641	22.5	0.0655	9.7	0.0498
Chromium +6	NA	NA	NA	NA	0.005	0.000015	0.012	0.000062
pH, Units	6.7	-	2.5	-	4.1-11.5		7.9	-
119 Chromium	NA	NA	NA	NA	0.86	0.00251	0.03	0.000154
120 Copper	NA	NA	NA	NA	<0.03	<0.000087	<0.02	<0.0001
121 Cyanide	NA	NA	NA	NA	0.014	0.000041	0.018	0.000093
122 Lead	NA	NA	11.0	0.0759	<0.07	<0.0002	<0.05	<0.00026
124 Nickel	NA	NA	NA	NA	0.03	0.000087	<0.02	<0.0001
128 Zinc	NA	NA	NA	NA	0.04	0.000117	1.51	0.00776

ND: None detected.
NA: Not analyzed.
* : Artifacts not originally present in wastewater.
# : Analyses were reported as less than some fairly large value (e.g., <0.6. <0.25).
ISD: Insufficient data to accurately quantify.

TABLE VII-3

EFFLUENT WASTE LOADS - HOT COATING - TERNE
SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

	Toxic Pollutant Survey		Original Guidelines Survey			
Plant Code	0856D(1) 113		0060(2) 00-2		0856D(1) PP-2	
Sample Points	C		4		2	
Flow. gal/ton	1006(3)		517		2194(3)	
C&TT	Under Construction		None		None	
	mg/1	lbs/1000 lbs	mg/1	lbs/1000 lbs	mg/1	lbs/1000 lbs
Suspended Solids	11	0.0461	48	0.103	9	0.0823
Oil and Grease	4	0.0168	10	0.0215	4.3	0.0393
Hexavalent Chromium	0.002	0.000008	<0.002	<0.000004	0.0034	0.000031
Tin	<0.1	<0.000042	<2	<0.00431	<2	<0.0183
pH, units	5.2-6.5	-	2.2-4.1	-	3.6-5.2	-
115 Arsenic	0.008	0.000034	NA	NA	NA	NA
119 Chromium	2.68	0.0112	0.03	0.000065	0.158	0.00144
120 Copper	0.04	0.000168	NA	NA	<0.02	<0.000183
121 Cyanide	0.003	0.000013	0.001	0.000002	0.006	0.000055
122 Lead	0.07	0.000293	0.20	0.000431	<0.05	<0.00046
123 Mercury	0.0001	<0.000001	<0.0003	<0.000001	0.0003	0.000003
124 Nickel	0.59	0.00247	NA	NA	0.03	0.000274
126 Silver	<0.025	<0.000105	NA	NA	NA	NA
128 Zinc	0.039	0.000390	0.91	0.00196	0.12	0.00110
Dissolved Iron	7.6	0.0319	74.0	0.159	13.3	0.122

---

(1) Plant visited during both surveys
(2) Data covers two Terne Coating operations
(3) Includes non-contact cooling water

NA: Not Analyzed

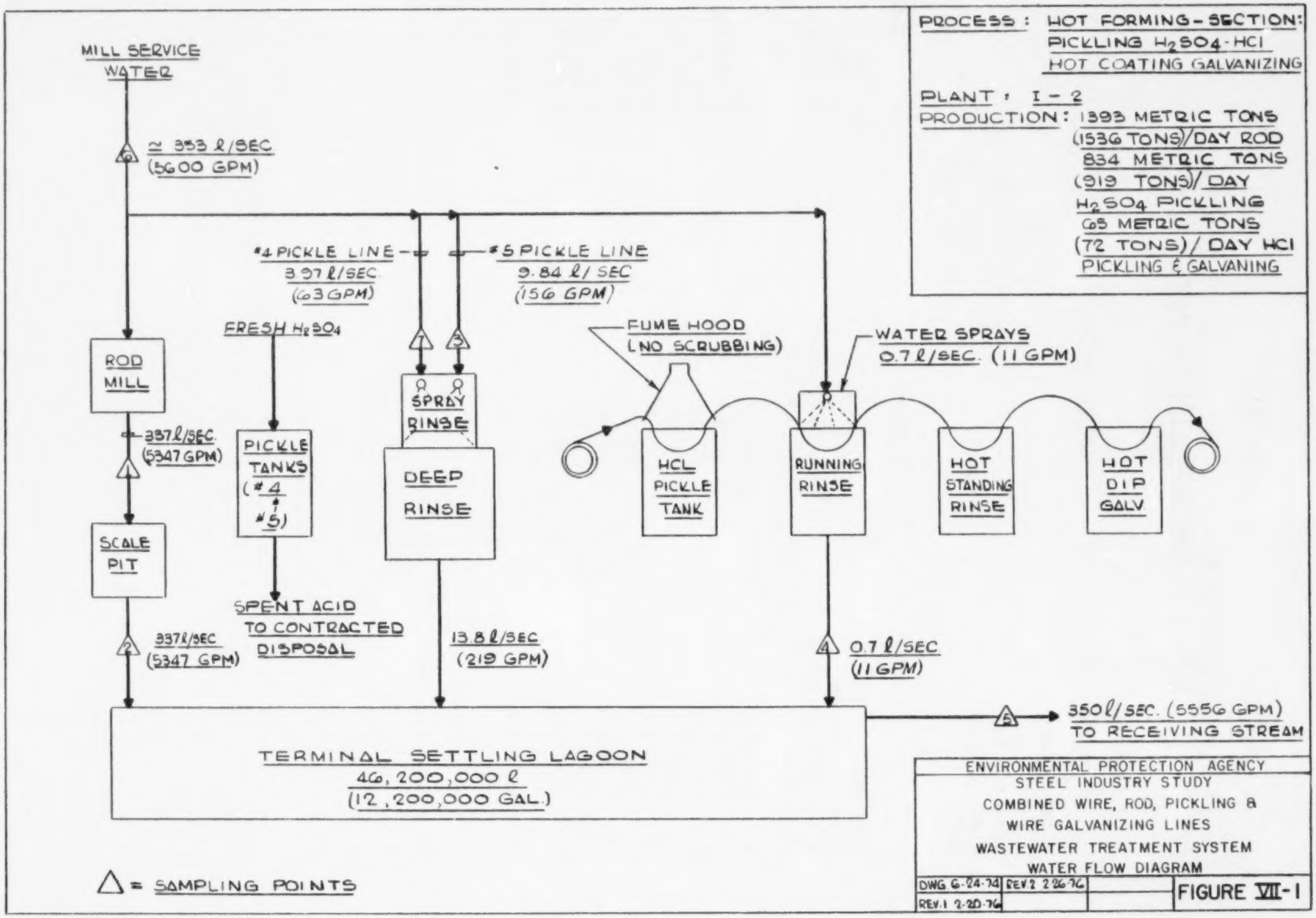
TABLE VII-4

EFFLUENT WASTE LOADS - HOT COATING - ALUMINIZING SUMMARY OF ANALYTICAL DATA FROM SAMPLED PLANTS

Toxic Pollutant Survey

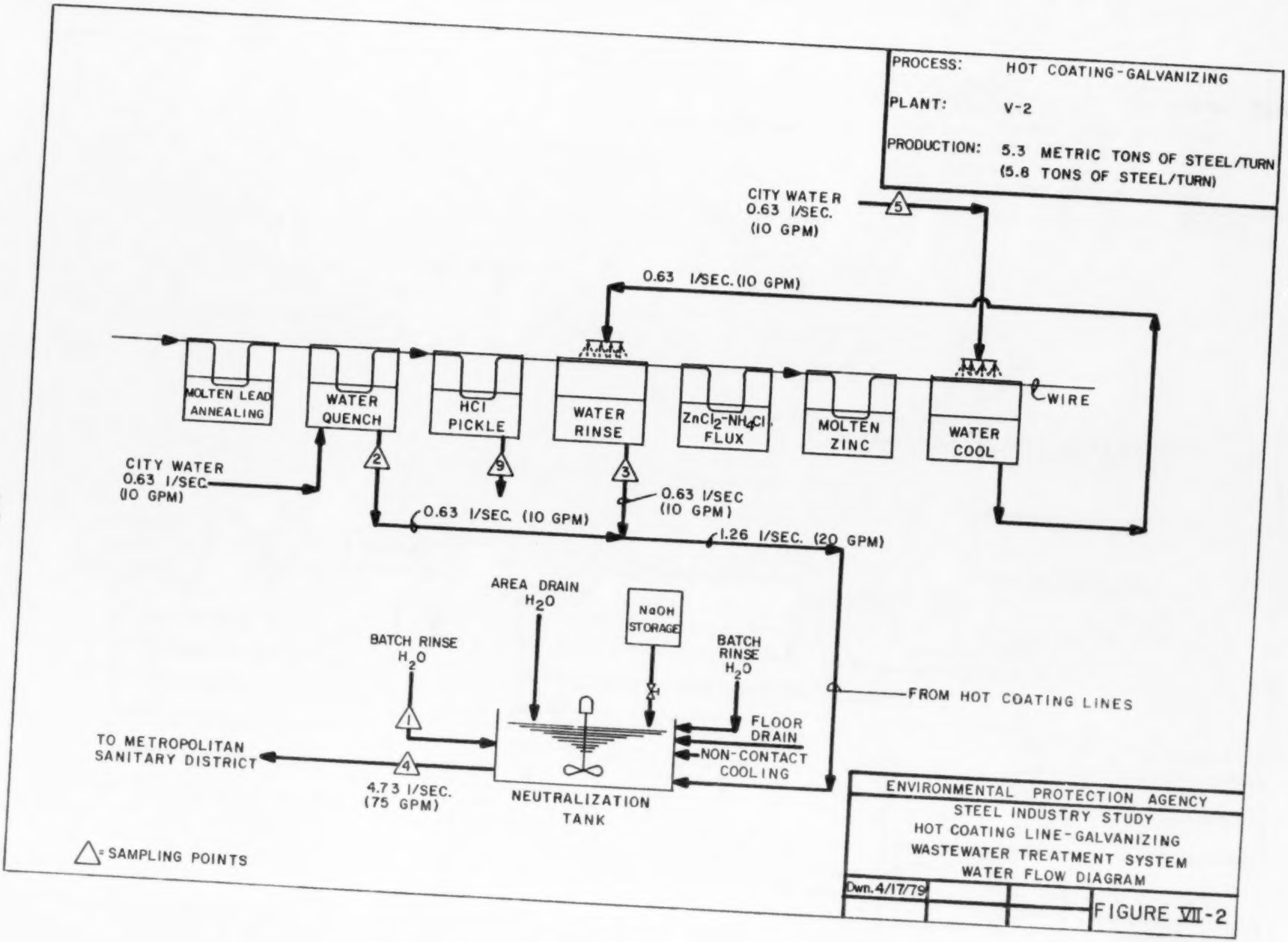
Plant Codes	0112I 116	
Sample Point	[E/(F+B)]H	
Flow- gal/ton	3960	
C&TT	NL,FLP,CL,FDSP	
	mg/l	lbs/1000 lbs
Suspended Solids	<1	<0.0165
Oils and Grease	4	0.0661
Hexavalent Chromium	0.003	0.000050
pH, units	7.3 - 7.7	-
115 Arsenic	NA	NA
118 Cadmium	<0.01	<0.000165
119 Chromium	<0.03	<0.000495
120 Copper	0.02	0.000330
121 Cyanide	0.001	0.000017
122 Lead	<0.08	<0.00132
124 Nickel	<0.025	<0.000413
126 Silver	<0.02	<0.000330
128 Zinc	0.13	0.00215
Dissolved Iron	0.04	0.000661

NA - Not analyzed



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
COMBINED WIRE, ROD, PICKLING & WIRE GALVANIZING LINES
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWG 6-24-74	REV 2 2-26-76		FIGURE VII-1
REV. 1 2-20-76			



PROCESS: HOT COATING-GALVANIZING

PLANT: V-2

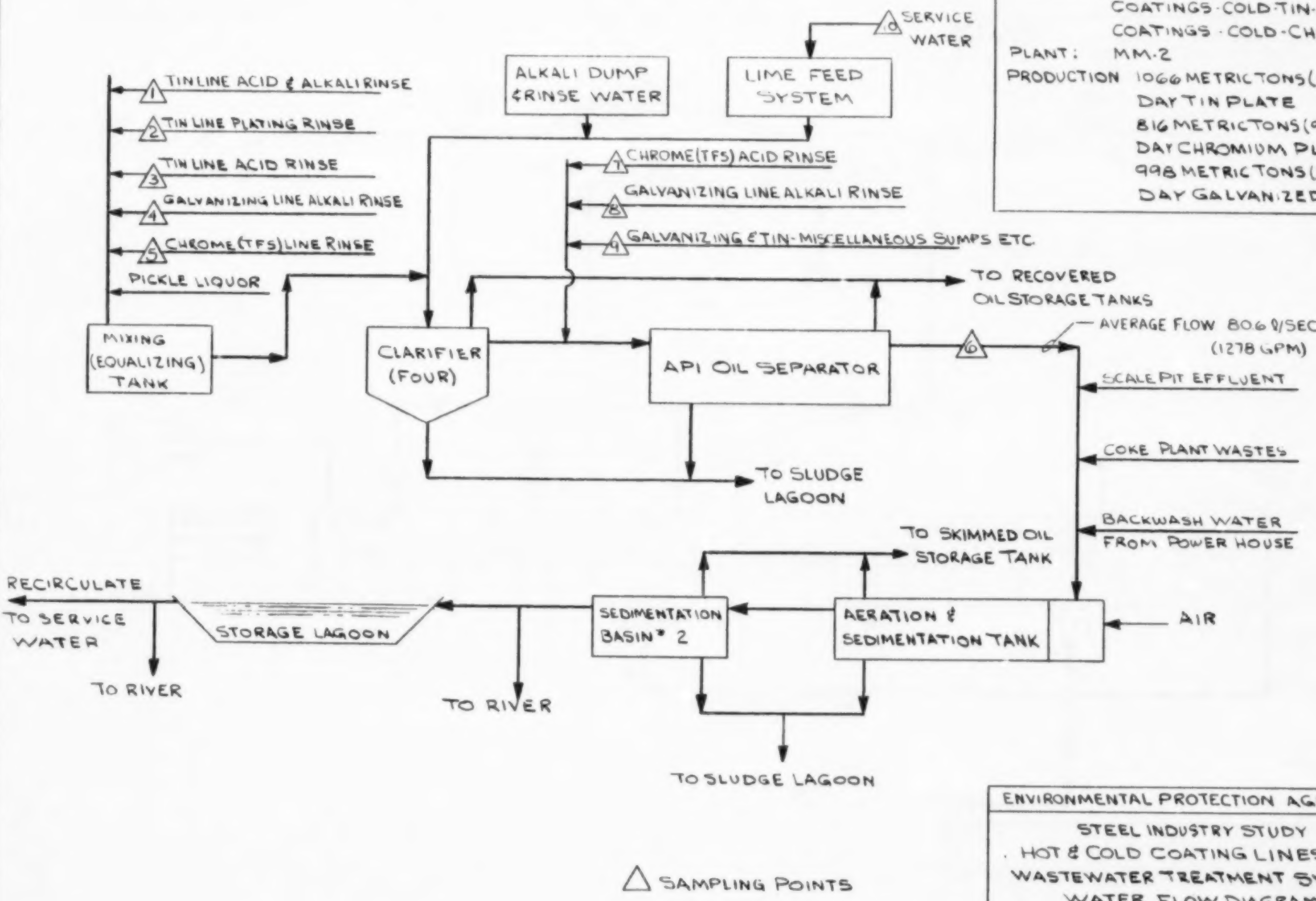
PRODUCTION: 5.3 METRIC TONS OF STEEL/TURN
(5.8 TONS OF STEEL/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATING LINE-GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

Dwn. 4/17/79

FIGURE VII-2

PROCESS: COATINGS HOT-GALVANIZING
COATINGS-COLD-TIN-PSA
COATINGS-COLD-CHROME
PLANT: MM-2
PRODUCTION 1066 METRIC TONS (1175 TONS)/
DAY TIN PLATE
816 METRIC TONS (900 TONS)/
DAY CHROMIUM PLATE
998 METRIC TONS (1100 TONS)/
DAY GALVANIZED PRODUCT

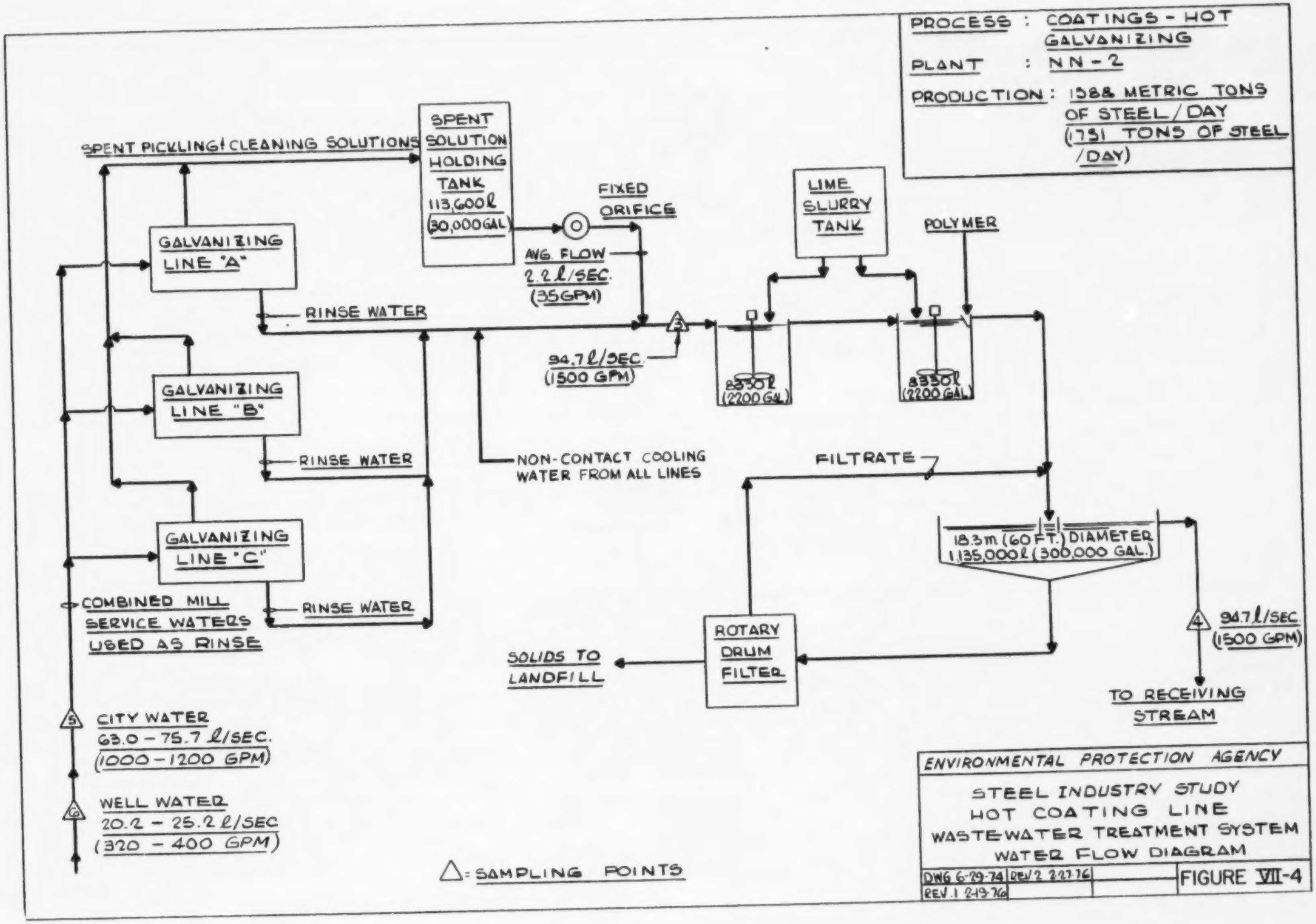


1 TIN LINE ACID & ALKALI RINSE
2 TIN LINE PLATING RINSE
3 TIN LINE ACID RINSE
4 GALVANIZING LINE ALKALI RINSE
5 CHROME (TFS) LINE RINSE
PICKLE LIQUOR
MIXING (EQUALIZING) TANK
ALKALI DUMP & RINSE WATER
LIME FEED SYSTEM
10 SERVICE WATER
7 CHROME (TFS) ACID RINSE
8 GALVANIZING LINE ALKALI RINSE
9 GALVANIZING & TIN-MISCELLANEOUS SUMPS ETC.
TO RECOVERED OIL STORAGE TANKS
CLARIFIER (FOUR)
API OIL SEPARATOR
6
AVERAGE FLOW 80.6 l/SEC (1278 GPM)
SCALE PIT EFFLUENT
COKE PLANT WASTES
TO SLUDGE LAGOON
BACKWASH WATER FROM POWER HOUSE
TO SKIMMED OIL STORAGE TANK
AIR
AERATION & SEDIMENTATION TANK
SEDIMENTATION BASIN # 2
STORAGE LAGOON
RECIRCULATE TO SERVICE WATER
TO RIVER
TO RIVER
TO SLUDGE LAGOON
△ SAMPLING POINTS

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT & COLD COATING LINES
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

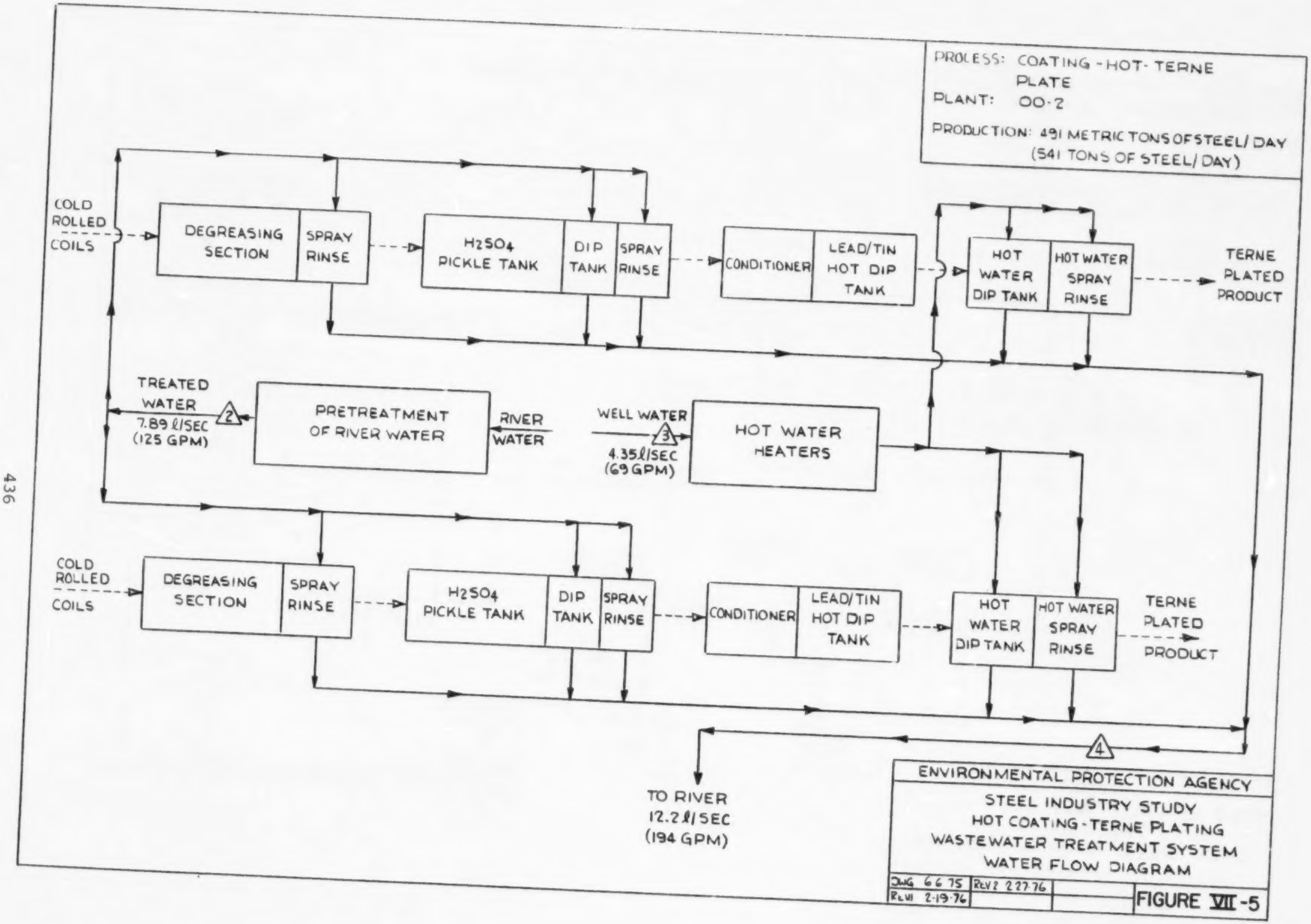
DWG 6-6-75	REV 2 2-27-76		FIGURE VII-3
REV 1 2-19-76			


PROCESS : COATINGS - HOT GALVANIZING
PLANT : NN - 2
PRODUCTION : 1388 METRIC TONS OF STEEL / DAY (1751 TONS OF STEEL / DAY)
SPENT PICKLING & CLEANING SOLUTIONS
SPENT SOLUTION HOLDING TANK 113,600 l (30,000 GAL)
FIXED ORIFICE
AVG. FLOW 2.2 l/SEC. (35 GPM)
LIME SLURRY TANK
POLYMER
GALVANIZING LINE "A"
GALVANIZING LINE "B"
GALVANIZING LINE "C"
RINSE WATER
RINSE WATER
RINSE WATER
3
94.7 l/SEC. (1500 GPM)
8330 l (2200 GAL)
8330 l (2200 GAL)
NON-CONTACT COOLING WATER FROM ALL LINES
FILTRATE
18.3 m (60 FT.) DIAMETER 1,135,000 l (300,000 GAL.)
COMBINED MILL SERVICE WATERS USED AS RINSE
ROTARY DRUM FILTER
SOLIDS TO LANDFILL
4
94.7 l/SEC. (1500 GPM)
TO RECEIVING STREAM
5
CITY WATER 63.0 - 75.7 l/SEC. (1000 - 1200 GPM)
6
WELL WATER 20.2 - 25.2 l/SEC (320 - 400 GPM)
△ : SAMPLING POINTS
DWG 6-29-74
REV. 1 2-19-76
REV. 2 2-27-76

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING LINE
WASTE-WATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

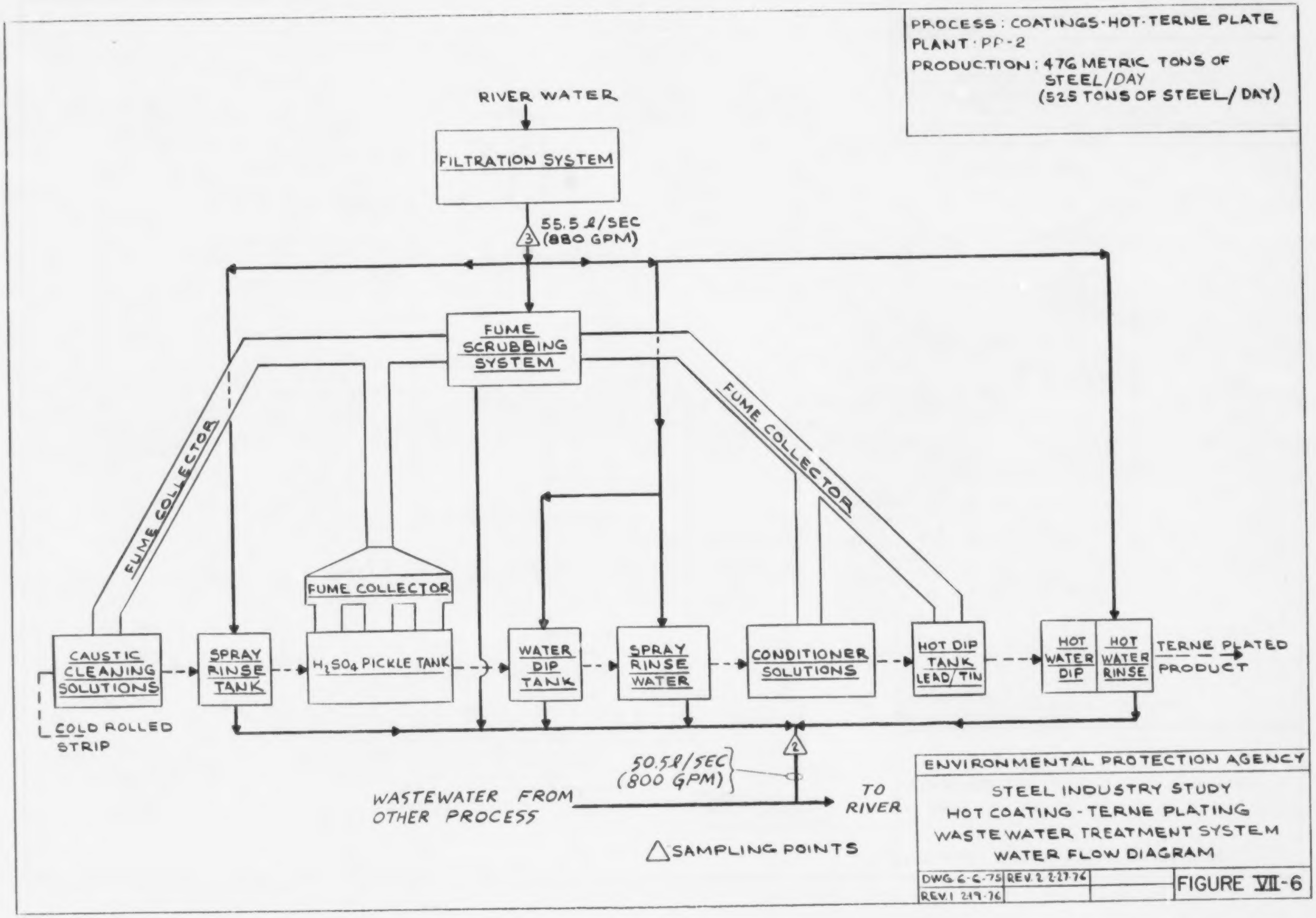
FIGURE VII-4



PROCESS: COATING - HOT - TERNE PLATE
PLANT: OO-2
PRODUCTION: 491 METRIC TONS OF STEEL/ DAY
(541 TONS OF STEEL/ DAY)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATING - TERNE PLATING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-5



PROCESS: COATINGS-HOT-TERNE PLATE
PLANT: PP-2
PRODUCTION: 476 METRIC TONS OF STEEL/DAY
(525 TONS OF STEEL/DAY)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING - TERNE PLATING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

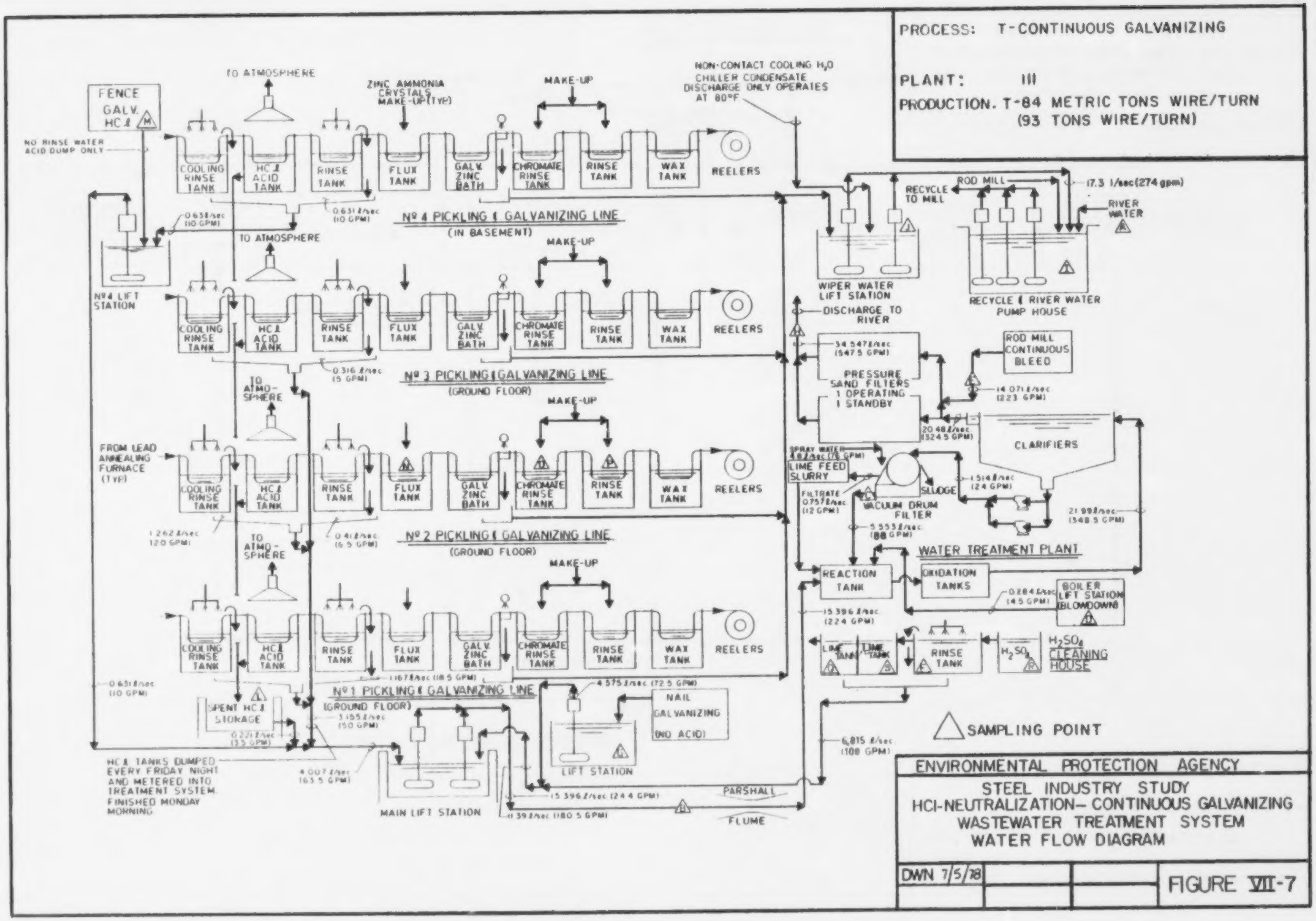
DWG 6-6-75 REV. 2 2-27-76
REV. 1 2-19-76

FIGURE VII-6

PROCESS: T-CONTINUOUS GALVANIZING

PLANT: III

PRODUCTION. T-84 METRIC TONS WIRE/TURN
(93 TONS WIRE/TURN)

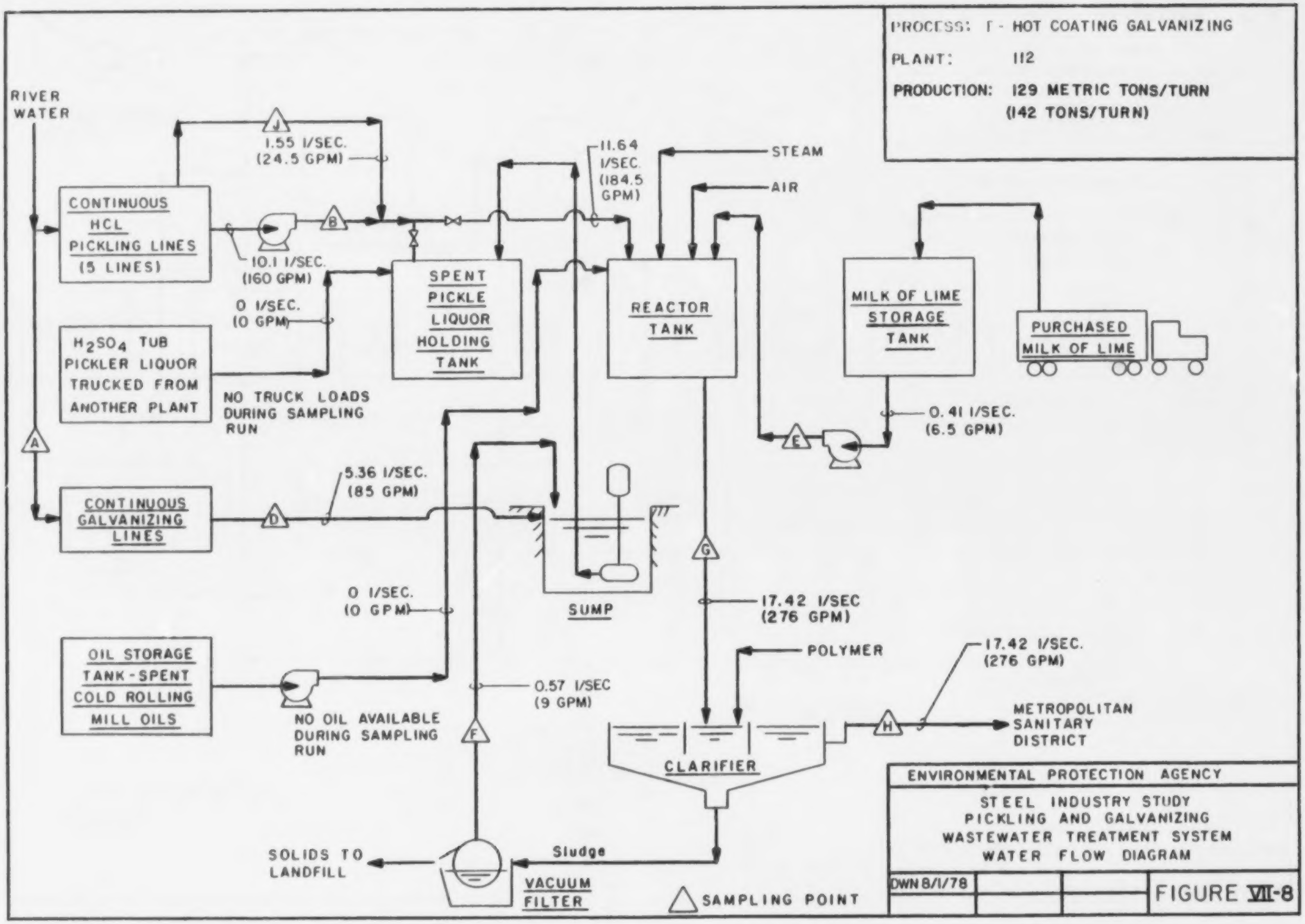


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HCl-NEUTRALIZATION– CONTINUOUS GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

DWN 7/5/78

FIGURE VII-7

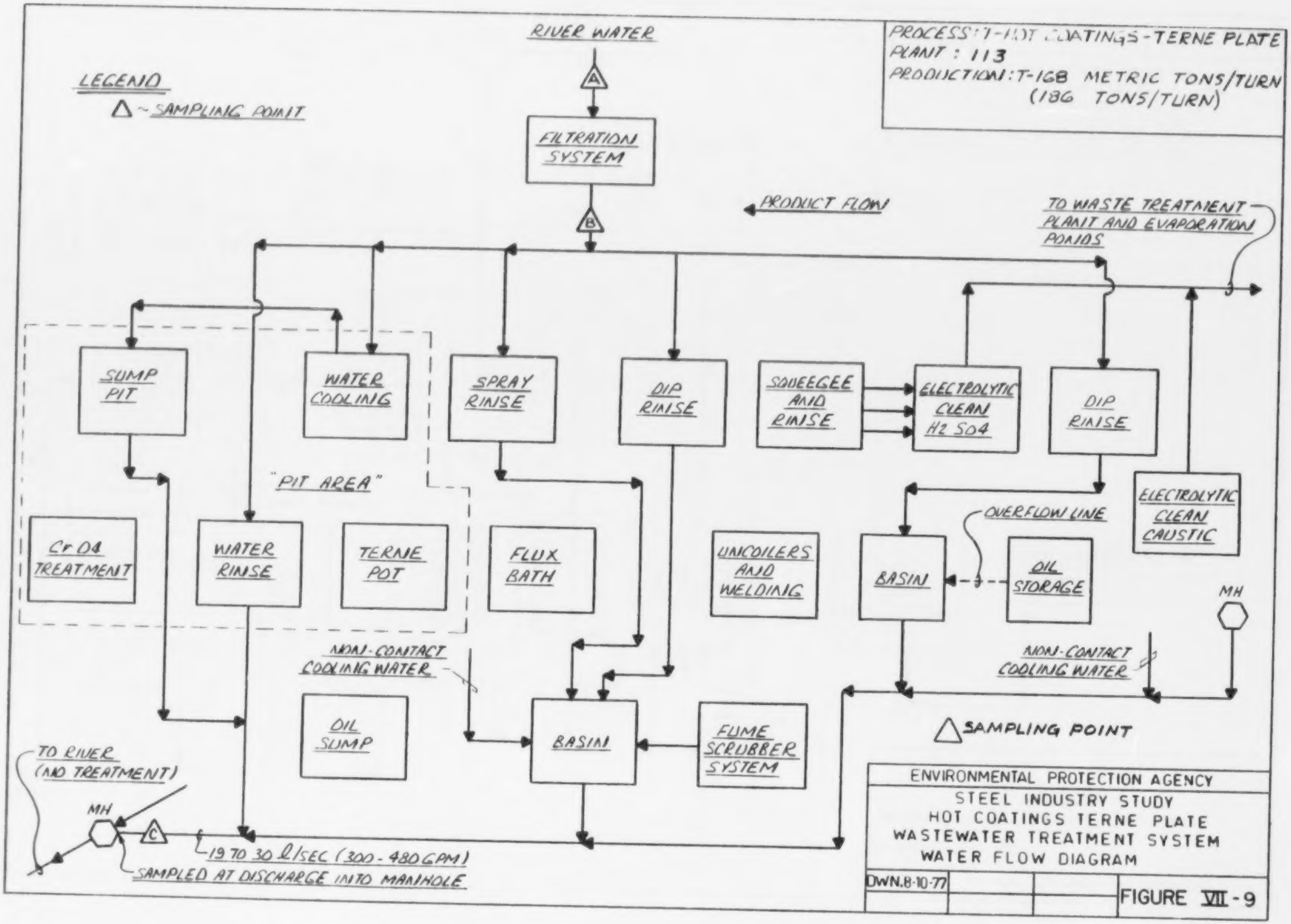


PROCESS: I - HOT COATING GALVANIZING
PLANT: 112
PRODUCTION: 129 METRIC TONS/TURN
(142 TONS/TURN)
RIVER WATER
CONTINUOUS HCL PICKLING LINES (5 LINES)
1.55 l/SEC. (24.5 GPM)
10.1 l/SEC. (160 GPM)
H$_2$SO$_4$ TUB PICKLER LIQUOR TRUCKED FROM ANOTHER PLANT
0 l/SEC. (0 GPM)
NO TRUCK LOADS DURING SAMPLING RUN
SPENT PICKLE LIQUOR HOLDING TANK
11.64 l/SEC. (184.5 GPM)
STEAM
AIR
REACTOR TANK
MILK OF LIME STORAGE TANK
PURCHASED MILK OF LIME
0.41 l/SEC. (6.5 GPM)
CONTINUOUS GALVANIZING LINES
5.36 l/SEC. (85 GPM)
SUMP
17.42 l/SEC (276 GPM)
POLYMER
OIL STORAGE TANK-SPENT COLD ROLLING MILL OILS
0 l/SEC. (0 GPM)
NO OIL AVAILABLE DURING SAMPLING RUN
0.57 l/SEC (9 GPM)
CLARIFIER
17.42 l/SEC. (276 GPM)
METROPOLITAN SANITARY DISTRICT
Sludge
SOLIDS TO LANDFILL
VACUUM FILTER
A
B
D
E
F
G
H
J
SAMPLING POINT
DWN 8/1/78

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
PICKLING AND GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

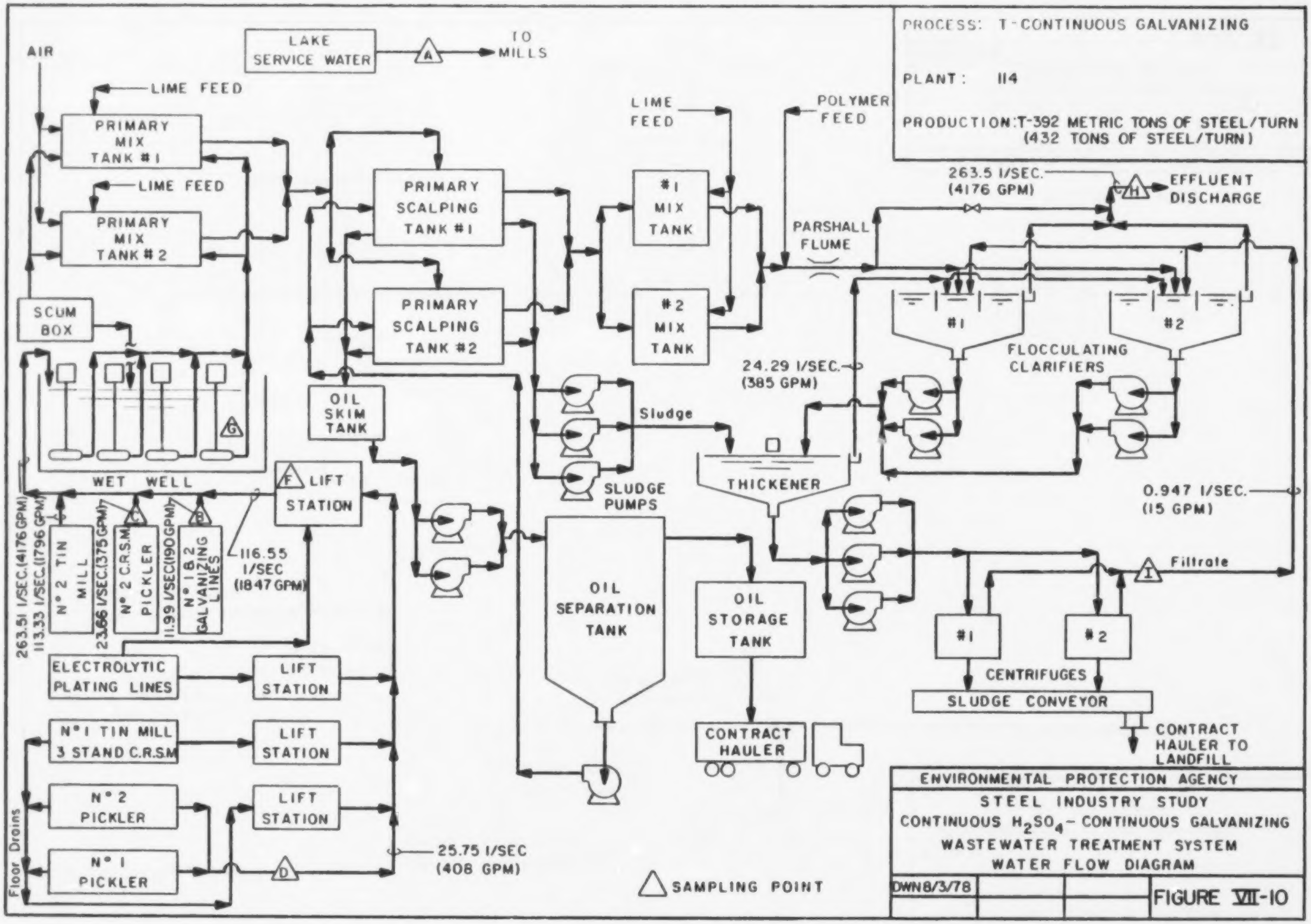
FIGURE VII-8



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS TERNE PLATE
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

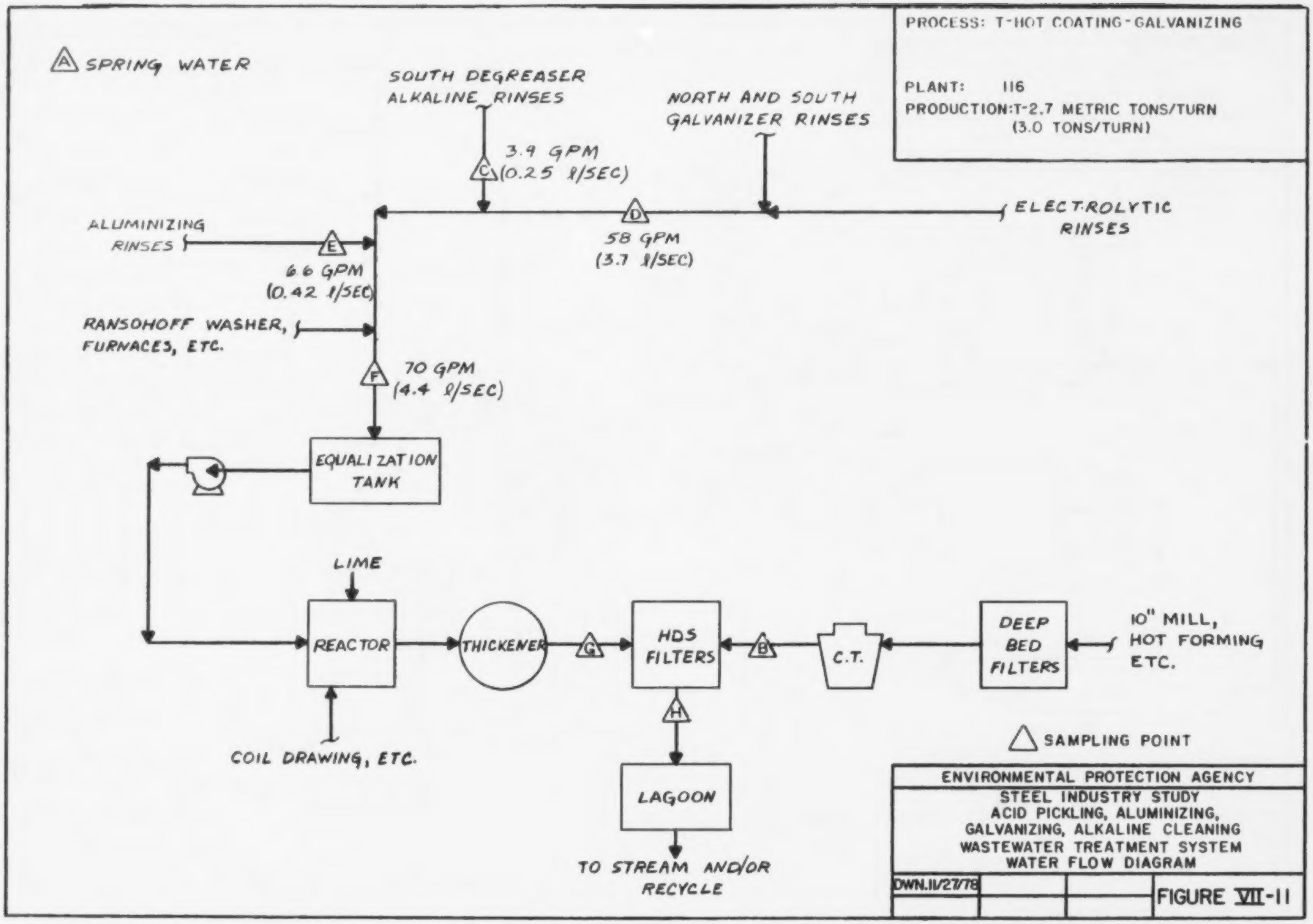
FIGURE VII-9



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
CONTINUOUS H_2SO_4 – CONTINUOUS GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-10

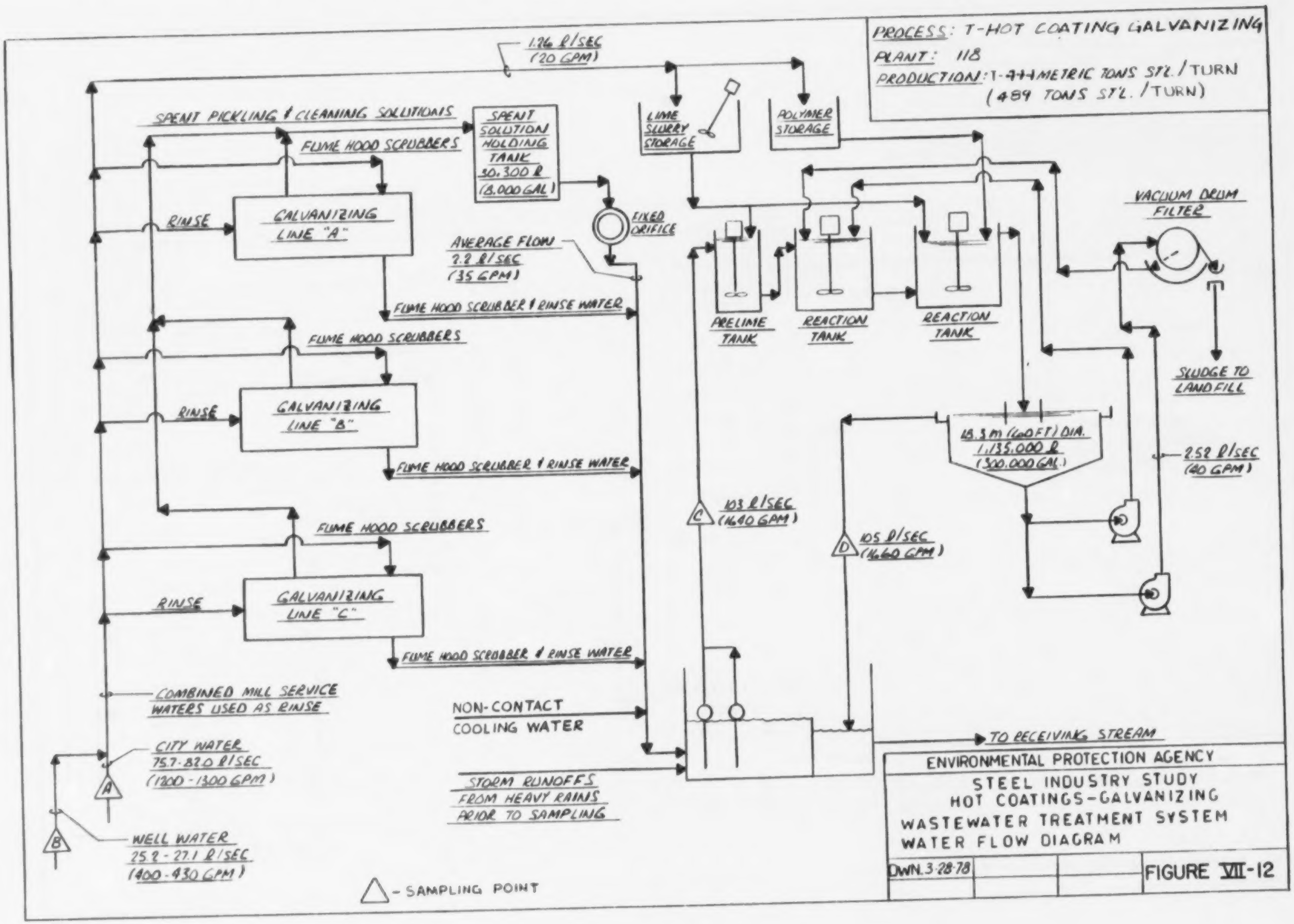


PROCESS: T-HOT COATING-GALVANIZING

PLANT: 116
PRODUCTION: T-2.7 METRIC TONS/TURN
(3.0 TONS/TURN)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
ACID PICKLING, ALUMINIZING,
GALVANIZING, ALKALINE CLEANING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

FIGURE VII-11



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-GALVANIZING
WASTEWATER TREATMENT SYSTEM
WATER FLOW DIAGRAM

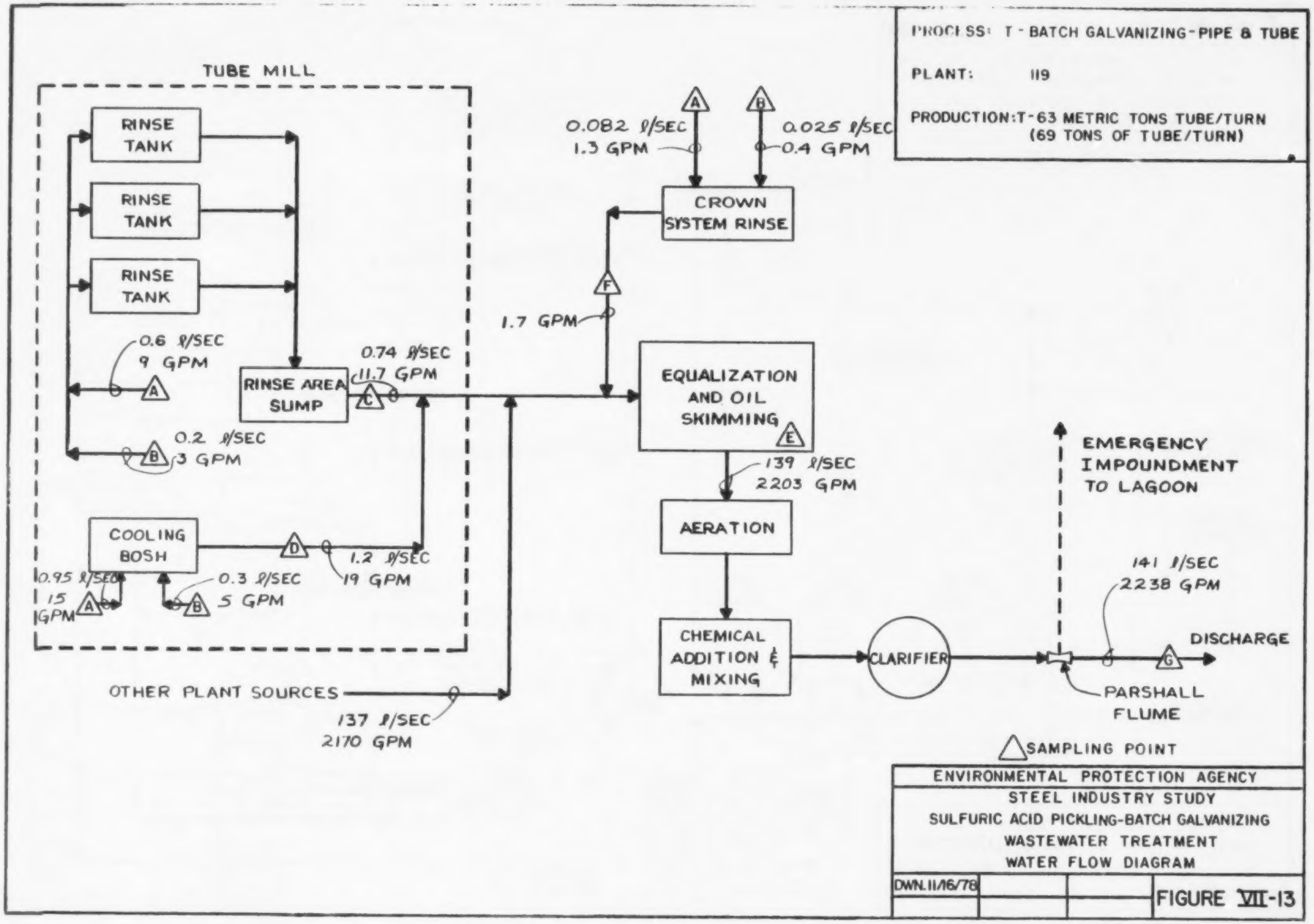
DWN. 3-28-78

FIGURE VII-12

PROCESS: T - BATCH GALVANIZING-PIPE & TUBE

PLANT: 119

PRODUCTION: T-63 METRIC TONS TUBE/TURN
(69 TONS OF TUBE/TURN)



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
SULFURIC ACID PICKLING-BATCH GALVANIZING
WASTEWATER TREATMENT
WATER FLOW DIAGRAM

DWN. 11/16/78

FIGURE VII-13

HOT COATING SUBCATEGORY

SECTION VIII

COST, ENERGY, AND NONWATER QUALITY IMPACTS

Introduction

This section presents the incremental costs incurred in applying the different levels of pollution control technology to the hot coating subcategory. The analysis also describes energy requirements, nonwater quality impacts (including air pollution, solid waste disposal and water consumption), and the techniques, magnitude, and costs for each level of technology for model plants.

Varying degrees of the technology described below are in use. Also, many combinations of various treatment methods are possible. Thus, not all plants are required to add all of the treatment technologies or incur all of the incremental costs indicated to bring existing facilities into compliance with the proposed effluent limitations and standards. Summaries of the alternative treatment systems applicable to each hot coating operation are depicted in Figures VIII-1 through VIII-3.

Costs

The water pollution control costs for seven of the nine plants visited during the study are presented in Table VIII-1. The remaining two plants provided no usable cost estimates. With the exception of Plant 116 (see footnote 2 on table), all costs apply to galvanizing operations only. At Plant 116, costs cover aluminizing and alkaline cleaning in addition to galvanizing. Terne coating wastewater treatment systems were under construction at three sites, but costs were not available at this writing. The treatment systems net raw waste and gross effluent loads are described in Sections V, VI, and VII. The costs were supplied by each plant, with all costs converted to July, 1978 dollars. Standard cost of capital and depreciation percentages were used so that these basic costs would be comparable.

Cost Comparisons for Facilities in Place

In order to determine whether its cost estimates were accurate and would cover actual site-specific costs, the Agency compared costs reported by plants (including all site-specific and retrofit costs) with model-based estimates of facilities in place. These data are summarized below:

Plant	Coated Product	Plant Reported Costs Table VIII-1	Model-based Estimate of Facilities In Place
For Plants Which Were Sampled			
112I	Fasteners	2,958,000[1]	518,000[1]
396A	Strip/Sheet	509,050	541,000
476A	Pipe & Tube	61,500	290,000
612	Wire	670,020	807,000
856F	Sheet	944,270	1,221,000
856P	Wire	14,310	23,000
920E	Strip/Sheet	1,500,930	1,965,000
Subtotal		3,700,080	4,847,000
For Plants Which Provided Costs in D-DCP Responses			
0580A	Wire	55,137	56,000
0728	Pipe	211,785[2]	105,000
0868A	Strip	233,232	1,580,000
0920F	Strip(Terne)	36,800	54,000
Subtotal		536,954	1,795,000
TOTAL (excluding 112I)		4,237,034	6,642,000
TOTAL (including 112I)		7,195,034	7,160,000

[1] Costs omitted from subtotal. Plant reported costs cover many operations other than hot coating, while model-based estimates are for hot coating only. See text discussion below for Plant 112I.

[2] Plant reported costs included a cooling tower, model-based costs do not.

Model-based estimates tend to be higher than actual plant costs, reflecting that model estimates adequately take into account site-specific costs. The few widely divergent costs reflect problems in apportioning total treatment plant costs for large central treatment systems back to individual small lines. Plant 112I broke down the $9.7 million capital expense of a plant-wide treatment system by assigning $5.4 million to the chemical treatment portion of this system, then further estimating that about 50-60 percent of such costs pertain to galvanizing, aluminizing, alkaline cleaning, and electrolytic coatings. No further breakdown was attempted, so the $2.9 million shown covers more operations than is expressed by the $518,000 model-based estimate.

Plant 476A also uses a large, plant-wide central treatment plant costing $7.1 million. Problems were encountered in factoring the 2200 GPM treatment facility costs back to the 20 GPM pipe and tube galvanizing line. Model-based estimates which are based upon separate treatment are five times higher than apportioned costs where galvanizing flows were less than one percent of total flows. A similar situation exists at Plant 0868A, where model-based estimates are nine times higher than plant-apportioned costs, even though the total treatment plant costs for Plant 0868A are listed as $4.86 million. Conversely, Plant 0728 costs include a cooling tower necessary to recycle wastewater to processes other than galvanizing, while model-based estimates do not require the use of cooling equipment. However, these were exceptions to generally comparable actual and estimated investment costs, and overall estimates based on model treatment systems appear reasonable and accurate. For the two plants where separate treatment of hot coating wastewaters is practiced, model-based estimates are higher than plant-reported actual costs. Based upon the above, the Agency concludes that its model based cost estimates are sufficiently generous to cover site specific and retrofit costs for the hot coating subcategory.

Control and Treatment Technology (C&TT)

The range of wastewater treatment technology in use or available for hot coating line operations is presented in Tables VIII-4 through VIII-6. In addition to presenting the range of treatment methods available, these tables also describe for each method:

1. Status and reliability
2. Problems and limitations
3. Implementation time
4. Land requirements
5. Environmental impacts other than water
6. Solid waste generation

Costs associated with the full range of treatment technology including investment, capital depreciation, operation and maintenance, and energy and power are presented on water treatment cost tables VIII-7 through VIII-19. Columns on cost tables are identified by letters corresponding to the appropriate treatment technology identified in Tables VIII-4 to VIII-6.

Estimated Costs for the Installation of Pollution Control Technologies

A. Costs Required to Achieve Proposed BPT Limitations

The BPT level of treatment provides for the following control measures: the blending and equalization of wastes from all rinsing and scrubbing operations; chromium reduction (if hexavalent chromium is present); neutralization of all wastewaters with lime or other suitable alkali; the addition of polymer with flocculation and settling in a clarifier or thickener; vacuum filtration of underflow sludges; and continuous surface skimming for oil removal. All flows from rinsing and scrubbing operations including fume scrubbing are discharged once-through following treatment.

Cost estimates for these BPT model treatment systems are provided in Tables VIII-7 through VIII-9. Using model costs as a basis, estimates were made of the cost of bringing each hot coating plant into compliance with the proposed BPT limitations. DCP data were reviewed to establish in-place components at each hot coating location. At the same time, the cost of each BPT model component was calculated, based on the production capacities reported for each plant. Results of this tabulation are shown in Tables VIII-20 through VIII-24 for the hot coating subdivisions. Table VIII-25 summarizes the expenditures which have been made and which are still necessary to bring all hot coating operations into compliance with the proposed BPT limitations. The estimated total cost of compliance for hot coating operations to attain the proposed BPT limitations is about $36 million. Total annual operating costs for these systems will be $12.8 million. These costs are conservative, since they are based only on co-treatment of hot coating wastewaters at a given site. In actual practice, most plants combine hot coating wastewaters with those from other forming and finishing operations for joint treatment. The economies of scale which result reduce capital investment and annual operating costs. Also, plants which are currently achieving zero discharge by internal recycle or reuse will not need to add those components which would be required for any plant discharging directly or indirectly.

B. Costs Required to Achieve the Proposed BAT Limitations

The Agency evaluated three alternative treatment systems to further reduce toxic pollutant discharges through further treatment of hot coating wastewaters. All three include cascade rinsing to minimize flows from the process, and where fume scrubbers are used, most of the water is recycled through the scrubber with minimal blowdown to treatment. Due to flow reductions, the existing BPT treatment system is able to function more efficiently, achieving lower effluent concentrations. As alternatives, this BAT effluent may be further treated either by sulfide precipitation followed by filtration, or by an evaporation and condensation system designed to produce dry solids and pure water. This latter alternative produces an effluent of virtually potable grade, and may be recycled in its entirety to the hot coating process as final rinsewater, or to any other use requiring water of such high quality. This treatment alternative achieves zero discharge of pollutants to receiving streams, but requires the expenditure of large amounts of energy and capital. It effectively controls all pollutants while producing a steady source of pure water.

BAT alternative treatment system costs are provided in Tables VIII-10 thorugh VIII-12. Refer to Section X for further discussion of estimated cost impacts and rationale for selecting the first alternative as the BAT model treatment system. The total capital cost for all hot coating operations to attain the proposed BAT limitations is estimated to be $11.2 million dollars, while annual operating costs will increase by $2.8 million over BPT costs.

C. Costs Required to Achieve the Proposed BCT Limitations

Table VIII-13 presents the incremental cost per pound for removing conventional pollutants (total suspended solids and oil and grease) employing the various BCT alternative treatment systems. The table included in this section is devoted to costs, but discussion of its interpretation and the BCT requirement is provided in Section XI, along with the rationale for selecting the appropriate BCT alternative treatment system. The capital and annual costs associated with the proposed BCT limitations are included in those for BAT.

D. Costs Required to Achieve the Proposed New Source Performance Standards (NSPS)

Two NSPS alternative treatment systems are described for hot coating operations. Both systems are the same as the BAT alternative treatment systems previously described. Model capital and annual operating costs are provided in Tables VIII-14 through VIII-16.

E. Costs Required to Achieve the Proposed Pretreatment Standards

Pretreatment standards apply to those plants discharging to POTW systems currently or in the future. For new source POTW dischargers, the proposed PSNS are the same as the proposed NSPS. For plants currently discharging to POTWs, the Agency considered two alternative treatment systems which are the same as the BAT alternative treatment systems. Refer to Model Cost Tables VIII-17 through VIII-19 for initial capital investments and annual operating costs for typical plants. The PSES costs on a subcategory bases are included in the BPT and BAT costs.

Energy Impacts Due to the Installation of the Requisite Technology

Moderate amounts of energy are required to operate wastewater treatment systems for hot coating operations. Most of the energy is consumed in operating the BPT model treatment systems, and many of these are already in place. It is estimated that BPT model treatment systems will use approximately 22 million kilowatts of electricity per year. This is a relatively insignficant portion of the 57 billion kilowatts used in the steel industry in 1978. Ninety percent of the electricity needed to operate hot coating treatment systems is associated with galvanizing lines. Refer to Table VIII-2 for a breakdown by hot coating subdivisions.

The additional requirements for upgrading BPT treatment systems to BAT levels are shown in Table VIII-3. Note that two of the three BAT alternative treatment systems consume very minor additional energy loads. Only Alternative No. 3, the one involving evaporation technology, consumes significant additional electricity, enough to mitigate against its selection as a BAT model treatment system. The selected BAT model treatment system (No. 1) will not increase energy consumption over BPT levels.

Energy impacts at NSPS and PSNS levels are slightly less than those at BPT, since flow reduction steps are incorporated as early as possible to minimize volumes requiring treatment. The Agency did not, however, calculate total subcategory impacts for NSPS and PSNS since predictions of expansion in this subcategory are not included in this study. Indirect discharger energy consumption is included in that for BPT and BAT.

Nonwater Quality Impacts

Air Pollution

Air pollution impacts from hot coating treatment systems are minimal. No cooling towers are required, and the only treatment step which could potentially affect air quality is the chromium reduction step required by a few galvanizing lines. Even there, relatively simple precautions can eliminate the potential for liberating sulfur dioxide, and well-maintained plants have demonstrated that no air pollution impact need occur.

BAT Alternative No. 2 would require the addition of sulfide precipitation as a dissolved metal control, and similar constraints would need to be applied to insure no release of hydrogen sulfide to the atmosphere. The use of ferrous sulfide as a sulfide source would minimize potential impacts from this step. No other air pollution impacts will result from installation of BAT, NSPS, or the Pretreatment systems.

Solid Wastes

The major nonwater quality impact associated with the treatment of wastewaters from hot coating operations is the generation of metallic hydroxide sludges during treatment. The BPT level of treatment would yield 400-500 tons per year of sludge from a typical 800 TPD galvanizing operation. On a dry weight basis, over 7700 tons of solids per year are generated by BPT model treatment systems, and an additional 1700 tons per year result from BAT systems for all hot coating operations. Contamination from trace amounts of the metals and from high concentrations of iron reduce the effectiveness of recovery processes. As a result, most hot coating wastewater treatment sludges are disposed of at landfills on or off site. Since some of the sludges are leachable, care must be taken to prevent redissolving precipitates at the landfill site. Even though metal hydroxides are relatively insoluble, toxic metal pollutants could find their way into groundwater or surface streams.

BAT nonwater quality impacts are less severe than those cited for the BPT model treatment systems, since the bulk of the sludge is generated at BPT. The sludge characteristics for Alternatives 1 and 2 are similar to BPT, and the previous discussion on sludge disposal applies to those two alternatives for each hot coating variation. Alternative 3 converts all remaining pollutants in the effluent from hot coating into dry solids, but these solids are much more soluble than the metal hydroxides and sulfides from BPT and BAT Alternatives 1 and 2. The major solids recovered by Alternative 3 are sulfates, chlorides, and carbonates, all of which can be readily leached out of open disposal pits. Prevention of runoff or percolation into subsurface aquifers is even more important under Alternative 3. Storage areas should have impervious liners to prevent percolation from the 75-100 additional tons per year of dry solids generated by Alternative 3 at a typical 800 TPD galvanizing operation. Since these solids are completely dewatered, and since the metal salts are soluble, consideration can be given to methods for recovery of metal values by electrolysis, ion-exchange, or reverse osmosis techniques. A choice of preferred method from among those available would involve additional research into the processes, their applicability and economics, but would be an important step in conservation of resources, especially where critical metals like chromium are involved.

However, notwithstanding the above, the Agency believes that the effluent reduction benefits associated with compliance with these proposed limitations and standards justify any adverse environmental effects associated with solid waste disposal. Most of the solid wastes described above are presently being generated and disposed of. The Agency believes that these wastes can be disposed of properly and in a safe manner.

Water Consumption

Water consumption caused by BPT model hot coating wastewater treatment systems is limited to the insignificant evaporation resulting from the installation of clarifiers or thickeners for removal of suspended matter. Impacts on water consumption at BAT levels are minimal or nonexistent. Temperatures are not raised sufficiently, due to countercurrent or cascade rinsing, or due to scrubber recycle, to significantly increase losses by evaporation. Hence, the Agency concludes that there are no significant water consumption impacts associated with the hot coatings subcategory.

Summary of Impacts

The Agency concludes that the benefits of pollutant control in the hot coating subcategory described below outweigh any adverse nonwater quality impacts associated with energy consumption, air pollution, solid waste disposal, and water consumption:

	Effluent Loadings (Tons/Yr)		
	Raw Waste	Proposed BPT	Proposed BAT & BCT
Flow, MGD	34.7	34.7	7.2
TSS	2,547	1,896	233
Oil and Grease	2,037	569	77.8
Toxic Metals	3,447	335	4.6
Toxic Organics	2.3	1.2	0.1

TABLE VIII-1

EFFLUENT TREATMENT COSTS REPORTED BY SAMPLED PLANTS
HOT COATING - GALVANIZING

Plant	I-2* 0856P	MM-2* 0856F	NN-2(1) 0920E	111* 0612	112* 0396A	116* 0112I	118(1) 0920E	119* 0476A
Initial Investment	14,310	944,270	1,500,930	670,020	509,050	2,958,000(2)	1,500,930	61,500
Annual Costs								
Operating Labor	NR	13,349		20,365		90,500	36,893	1,709
Utilities	NR	42,858	129,423	44,804	30,496	24,000	67,224	1,588
Maintenance	225	18,737		37,987		25,000	67,695	1,128
Depreciation	1,431	94,427	150,093	67,002	50,905	295,800	150,093	6,150
Costs of Capital	615	40,604	64,540	28,811	21,889	127,194	64,540	2,645
Other	136	36,768	-	-	-	8,500	-	2,582
TOTAL	2,407	246,743	344,056	198,969	103,290	570,994	386,445	15,802
$/Ton	0.559	1.376	0.755	2.586	0.933	13.56	1.079	0.980
$/1000 gal trt.	2.54	2.565	0.612	1.835	3.249	20.86	0.906	6.67

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(1) NN-2 and 118 are the same plant. This solo-treated galvanizing operation was sampled during both surveys.
(2) Plant estimated share of total cost attributed to processes surveyed at this site. Costs include galvanizing, aluminizing, and alkaline treatment systems on-site.

*: Portion attributed to this subcategory only.
NR: No costs provided by company.

TABLE VIII-2

ENERGY REQUIREMENTS TO ACHIEVE BPT LIMITS HOT COATING OPERATIONS

Process	Mode	Power Required kw	Power Required hp	Annual Cost 7/1/78 Dollars
Galvanizing				
Strip/Sheet & Misc. Products	w/scrubbers	81.4	109	12,700
	wo/scrubbers	53.2	71.3	8,300
Wire Products & Fasteners	w/scrubbers	44.2	59.3	6,900
	wo/scrubbers	25.6	34.3	4,000
Terne Coating				
Strip/Sheet	w/scrubbers	43.6	58.5	6,800
	wo/scrubbers	30.1	40.4	4,700
Other Coatings				
Strip/Sheet & Misc. Products	w/scrubbers	57.7	77.4	9,000
	wo/scrubbers	33.3	44.7	5,200
Wire Products & Fasteners	w/scrubbers	10.3	13.8	1,600
	wo/scrubbers	7.1	9.5	1,100

TABLE VIII-3

ENERGY REQUIREMENTS TO ACHIEVE BAT LIMITATIONS HOT COATING OPERATIONS

Process	Alternative	Mode	Power Required kw	Power Required hp	Annual Cost 7/1/78 Dollars
Galvanizing					
Strip/Sheet & Miscellaneous Products	I	w/scrubbers	-	-	-
		wo/scrubbers	-	-	-
	II	w/scrubbers	3.8	5.1	600
		wo/scrubbers	3.2	4.3	500
	III	w/scrubbers	600	805	93,500
		wo/scrubbers	448	600	69,900
Wire Products & Fasteners	I	w/scrubbers	-	-	-
		wo/scrubbers	-	-	-
	II	w/scrubbers	2.6	3.5	400
		wo/scrubbers	1.9	2.5	300
	III	w/scrubbers	281	377	43,800
		wo/scrubbers	227	304	35,400
Terne Coating					
Strip/Sheet	I	w/scrubbers	-	-	-
		wo/scrubbers	-	-	-
	II	w/scrubbers	2.6	3.5	400
		wo/scrubbers	1.9	3.5	300
	III	w/scrubbers	275	369	42,900
		wo/scrubbers	205	275	32,000
Other Metal Coatings					
Strip/Sheet & Miscellaneous Products	I	w/scrubbers	-	-	-
		wo/scrubbers	-	-	-
	II	w/scrubbers	2.6	3.5	400
		wo/scrubbers	2.6	3.5	400
	III	w/scrubbers	374	502	58,400
		wo/scrubbers	281	377	43,800
Wire Products & Fasteners	I	w/scrubbers	-	-	-
		wo/scrubbers	-	-	-
	II	w/scrubbers	1.3	1.7	200
		wo/scrubbers	1.3	1.7	200
	III	w/scrubbers	43.6	58.5	6,800
		wo/scrubbers	33.3	44.7	5,100

TABLE VIII-4

CONTROL AND TREATMENT TECHNOLOGY
HOT COATING - GALVANIZING

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Blend and equalize flows of acidic and alkaline wastewaters	Practiced at majority of treatment plants	Uses up valuable space	2-3 months	2500 to 10,000 sq.ft.	Aesthetically unappealing	Some solids settle out; <1 ton per day per plant.
B. Add lime or other alkali to pH 8-10 in a reactor tank with mixing. (If Cr^{+6} is present, this step follows Step C.)	Widely practiced (77% of all plants) in this subcategory. Very reliable control.	Requires high level of maintenance and monitoring of treatment process.	6-12 months	120 to 500 sq.ft.	Sludges which form are not reusable; potential for air pollution while handling lime.	Metal hydroxide sludges accumulate at from 2 to 10 tons per day per plant.
C. If Cr^{+6} is present, install chemical reduction system. Provide sufficient retention time to reduce all chromium.	About 10% of all plants are now practicing chromium reduction.	Increased chemical and instrumentation costs are required.	3-4 months	150 to 600 sq.ft.	None	Negligible
D. Add polymer selected to improve flocculation and sedimentation.	Nearly 50% of all plants use this technology.	Increased chemical costs are required.	1-2 months	100 to 250 sq.ft.	None	Improves sludge characteristics. Sludge is more easily dewatered.
E. Add automatic surface skimming (to thickener-Step F) for recovery of floating oils.	About 40% of all plants recover floating oils.	None	2-3 months	No additional land is required.	Minor, since the recovered oils are recyclable.	No impact on solid waste generation.
F. Install thickener or clarifier to provide efficient settling of precipitates and other suspended matter.	Nearly two-thirds of plants use this technology; very reliable.	Largest capital cost equipment in common use.	6-12 months	750 to 5000 sq.ft.	Increased energy consumption.	Recovers solids generated at Steps A and B in the form of a slurry with about 5% solids.

TABLE VIII-4
CONTROL AND TREATMENT TECHNOLOGIES
HOT COATING - GALVANIZING
PAGE 2

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
G. Add vacuum filtration of thickener underflows; recycle filtrates to thickener, sludge to landfill (end of BPT system).	About 25% of the plants do this.	High level of maintenance is required for filters.	2-4 months	250 to 1000 sq.ft.	Uses more energy.	Sludges from E are dewatered to 30-50% solid consistency. Reduces impact at disposal site.
H-1. Install cascade rinsing system to minimize rinsewater flow; equip fume hood scrubber to run on recycled water, either before or after treatment. Blowdown 8-10% of flow from scrubber and 25% of rinsewater applied rate to existing treatment. H-2. (For lines with no scrubbers) Install cascade rinsing system to reduce flow by 75%. Discharge to existing treatment system (end of BAT Alternative 1).	Less than 10% of the plants cascade rinse, although about a third of plants with scrubbers do recycle to minimize flow discharged.	Scrubber must be designed to run on recycled water; cascade rinse system is installed during mill shutdown period. Benefits outweigh disadvantages.	4-6 months	From no additional land to 50-100 sq.ft. depending on presence or absence of scrubbers.	Minimal increase in energy requirements.	Same as in once-through system, except that the new, longer retention time yields a denser, more readily dewatered sludge.
I. Install sulfide precipitation system to treat dissolved metals. Iron sulfide system has fewer problems, and is recommended over systems using soluble sulfides.	None in hot coating subcategory, but is used on very similar wastes in metal finishing & electroplating.	Soluble sulfide compounds are unstable & difficult to store. Use FeS.	2-4 months	100 to 500 sq.ft.	Potential for air pollution from H_2S if soluble sulfides are used.	Only minor increase over BAT Alt. 1 system; sulfide precpitates are less leachable than hydroxides.
J. Install pressure filter to treat blowdown from sulfide precipitation step. Return filter backwash to thickener (Step F) (end of BAT Alternative 2).	21% of all galvanizing lines now use pressure filtration.	Higher operating and maintenance costs. Benefits outweigh disadvantages.	6-8 months	200 to 750 sq.ft.	None	Filter backwash ends up as part of load at Step G.

TABLE VIII-4
CONTROL AND TREATMENT TECHNOLOGIES
HOT COATING - GALVANIZING
PAGE 3

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
K. Folliwng Step H-1 or H-2, add an evaporation and condensation system to produce potable-grade water and dry solids.	Not practiced in this industry. Is done in other industries at locations where pure water is in short supply.	Very high investment, operating, maintenance and energy costs. Must have use for the pure water produced.	12-18 months	4,000-10,000 square feet.	Very high energy demand.	Converts all pollutants to dry solids, many of which are readily leachable.
L. Install recycle pump station to convey condensate from Step K back to process, or other use where pure water is required. (End of BAT Alternative 3).	About 15% of the plants recycle and 20% reuse water of poorer quality than this condensate.	None	1-2 months	Included in Step K	None	None

TABLE VIII-5

CONTROL AND TREATMENT TECHNOLOGY
HOT COATING - TERNE

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Blend and equalize flows of acidic and alkaline wastewaters	Practiced at majority of treatment plants	Uses up valuable space	2-3 months	1,000 to 7,500 sq.ft.	Aesthetically unappealing	Some solids settle out; <1 ton per day per plant.
B. Add lime or other alkali to pH 8-10 in a reactor tank with mixing.	Practiced at 50% of all plants in this subcategory. Very reliable control.	Requires high level of maintenance and monitoring of treatment process.	6-12 months	120 to 500 sq.ft.	Sludges which form are not reusable; potential for air pollution while handling lime.	Metal hydroxide sludges accumulate at from 2 to 10 tons per day per plant.
C. Provide for aeration of all wastewaters via mechanical agitation or blowers.	About 20% of all plants are now practicing aeration.	Increased energy consumption to operate equipment.	3-4 months	150 to 600 sq.ft.	None	Negligible
D. Add polymer selected to improve flocculation and sedimentation.	Nearly 50% of all plants use this technology.	Increased chemical costs are required.	1-2 months	100 to 250 sq.ft.	None	Improves sludge characteristics. Sludge is more easily dewatered.
E. Add automatic surface skimming (to thickener-Step F) for recovery of floating oils.	About 40% of all plants recover floating oils.	None	2-3 months	No additional land is required.	Minor, since the recovered oils are recyclable.	No impact on solid waste generation.
F. Install thickener or clarifier to provide efficient settling of precipitates and other suspended matter.	Nearly half of plants use this technology; very reliable.	Largest capital cost equipment in common use.	6-12 months	750 to 5000 sq.ft.	Increased energy consumption.	Recovers solids generated at Steps A and B in the form of a slurry with about 5% solids.

TABLE VIII-5
CONTROL AND TREATMENT TECHNOLOGIES
HOT COATING - TERNE
PAGE 2

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
G. Add vacuum filtration of thickener underflows; recycle filtrates to thickener, sludge to landfill (end of BPT system).	About 20% of the plants do this.	High level of maintenance is required for filters.	2-4 months	250 to 1000 sq.ft.	Uses more energy.	Sludges from E are dewatered to 30-50% solid consistency. Reduces impact at disposal site.
H-1. Install cascade rinsing system to minimize rinsewater flow; equip fume hood scrubber to run on recycled water, either before or after treatment. Blowdown 8-10% of flow from scrubber and 25% of rinsewater applied rate to existing treatment. H-2. (For lines with no scrubbers) Install cascade rinsing system to reduce flow by 75%. Discharge to existing treatment system (end of BAT Alternative 1).	Less than 10% of the plants cascade rinse, although about a third of plants with scrubbers do recycle to minimize flow discharged.	No plants practice rinse flow reduction. Technology is transferrable from galvanizing; all scrubbers are currently once-through but could be recycled as in galvanizing.	4-6 months	From no additional land to 50-100 sq.ft. depending on presence or absence of scrubbers.	Minimal increase in energy requirements.	Same as in once-through system, except that the new, longer retention time yields a denser, more readily dewatered sludge.
I. Install sulfide precipitation system to treat dissolved metals. Iron sulfide system has fewer problems, and is recommended over systems using soluble sulfides.	None in hot coating subcategory, but is used on very similar wastes in metal finishing & electroplating.	Soluble sulfide compounds are unstable & difficult to store. Use FeS.	2-4 months	100 to 500 sq.ft.	Potential for air pollution from H_2S if soluble sulfides are used.	Only minor increase over BAT Alt. 1 system; sulfide precpitates are less leachable than hydroxides.
J. Install pressure filter to treat blowdown from sulfide precipitation step. Return filter backwash to thickener (Step F) (End of BAT Alternative 2).	No terne lines practice filtration, but the technology is readily transferrable from other hot coating operations.	Higher operating and maintenance costs. Benefits outweigh disadvantages.	6-8 months	200 to 750 sq.ft.	None	Filter backwash ends up as part of load at Step G.

TABLE VIII-5
CONTROL AND TREATMENT TECHNOLOGIES
HOT COATING - TERNE
PAGE 3

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and. Primary Constituents
K. Folliwng Step H-1 or H-2, add an evaporation and condensation system to produce potable-grade water and dry solids.	Not practiced in this industry. Is done in other industries at locations where pure water is in short supply.	Very high investment, operating, maintenance and energy costs. Must have use for the pure water produced.	12-18 months	4,000-10,000 square feet.	Very high energy demand.	Converts all pollutants to dry solids, many of which are readily leachable.
L. Install recycle pump station to convey condensate from Step K back to process, or other use where pure water is required. (End of BAT Alternative 3).	No terne lines currently practice recycle. Technology is transferrable from galvanizing.	None	1-2 months	Included in Step K	None	None

TABLE VIII-6

CONTROL AND TREATMENT TECHNOLOGY
HOT COATING - OTHER METALS

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
A. Blend and equalize flows of acidic and alkaline wastewaters	Practiced at majority of treatment plants	Uses up valuable space	2-3 months	1,000 to 7,500 sq.ft.	Aesthetically unappealing	Some solids settle out; <1 ton per day per plant.
B. Add lime or other alkali to pH 8-10 in a reactor tank with mixing.	Practiced at 50% of all plants in this subcategory. Very reliable control.	Requires high level of maintenance and monitoring of treatment process.	6-12 months	120 to 500 sq.ft.	Sludges which form are not reusable; potential for air pollution while handling lime.	Metal hydroxide sludges accumulate at from 2 to 10 tons per day per plant.
C. Provide for aeration of all wastewaters via mechanical agitation or blowers.	About 20% of all plants are now practicing aeration.	Increased energy consumption to operate equipment.	3-4 months	150 to 600 sq.ft.	None	Negligible
D. Add polymer selected to improve flocculation and sedimentation.	Nearly 50% of all plants use this technology.	Increased chemical costs are required.	1-2 months	100 to 250 sq.ft.	None	Improves sludge characteristics. Sludge is more easily dewatered.
E. Add automatic surface skimming (to thickener-Step F) for recovery of floating oils.	About 40% of all plants recover floating oils.	None	2-3 months	No additional land is required.	Minor, since the recovered oils are recyclable.	No impact on solid waste generation.
F. Install thickener or clarifier to provide efficient settling of precipitates and other suspended matter.	Nearly half of plants use this technology; very reliable.	Largest capital cost equipment in common use.	6-12 months	750 to 5000 sq.ft.	Increased energy consumption.	Recovers solids generated at Steps A and B in the form of a slurry with about 5% solids.

TABLE VIII-6
CONTROL AND TREATMENT TECHNOLOGIES
HOT COATING - OTHER METALS
PAGE 2

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
G. Add vacuum filtration of thickener underflows; recycle filtrates to thickener, sludge to landfill (end of BPT system).	About 20% of the plants do this.	High level of maintenance is required for filters.	2-4 months	250 to 1000 sq.ft.	Uses more energy.	Sludges from E are dewatered to 30-50% solid consistency. Reduces impact at disposal site.
H-1. Install cascade rinsing system to minimize rinsewater flow; equip fume hood scrubber to run on recycled water, either before or after treatment. Blowdown 8-10% of flow from scrubber and 25% of rinsewater applied rate to existing treatment. H-2. (For lines with no scrubbers) Install cascade rinsing system to reduce flow by 75%. Discharge to existing treatment system (end of BAT Alternative 1).	Less than 10% of the plants cascade rinse, although about a third of plants with scrubbers do recycle to minimize flow discharged.	Only one plant practices rinse flow reduction. Technology is transferrable from galvanizing. The only scrubber currently recycles at a very high rate.	4-6 months	From no additional land to 50-100 sq.ft. depending on presence or absence of scrubbers.	Minimal increase in energy requirements.	Same as in once-through system, except that the new, longer retention time yields a denser, more readily dewatered sludge.
I. Install sulfide precipitation system to treat dissolved metals. Iron sulfide system has fewer problems, and is recommended over systems using soluble sulfides.	None in hot coating subcategory, but is used on very similar wastes in metal finishing & electroplating.	Soluble sulfide compounds are unstable & difficult to store. Use FeS.	2-4 months	100 to 500 sq.ft.	Potential for air pollution from H_2S if soluble sulfides are used.	Only minor increase over BAT Alt. 1 system; sulfide precpitates are less leachable than hydroxides.
J. Install pressure filter to treat blowdown from sulfide precipitation step. Return filter backwash to thickener (Step F) (End of BAT Alternative 2).	18% of the plants practice filtration.	Higher operating and maintenance costs. Benefits outweigh disadvantages.	6-8 months	200 to 750 sq.ft.	None	Filter backwash ends up as part of load at Step G.

TABLE VIII-6
CONTROL AND TREATMENT TECHNOLOGIES
HOT COATING - OTHER METALS
PAGE 3

Treatment and/or Control Methods Employed	Status and Reliability	Problems and Limitations	Implementation Time	Land Requirements	Environmental Impact Other Than Water	Solid Waste Generation and Primary Constituents
K. Folliwng Step H-1 or H-2, add an evaporation and condensation system to produce potable-grade water and dry solids.	Not practiced in this industry. Is done in other industries at locations where pure water is in short supply.	Very high investment, operating, maintenance and energy costs. Must have use for the pure water produced.	12-18 months	4,000-10,000 square feet.	Very high energy demand.	Converts all pollutants to dry solids, many of which are readily leachable.
L. Install recycle pump station to convey condensate from Step K back to process, or other use where pure water is required. (End of BAT Alternative 3).	25% of the plants currently recycle or reuse water of poorer quality than this.	None	1-2 months	Included in Step K	None	None

TABLE VIII-7

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc. Prod.
: With Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	A E	B N_L	C CR	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $ x 10^{-3}	228	154	123	126	11	413	180	1235
Annual Cost $ x 10^{-3}								
Capital	9.8	6.6	5.3	5.4	0.5	17.7	7.7	53.0
Depreciation	22.8	15.4	12.3	12.6	1.1	41.3	18.0	123.5
Operation & Maintenance	8.0	5.4	4.3	4.4	0.4	14.4	6.3	43.2
Sludge Disposal(2)	-	-	-	-	-	-	6.2	6.2
Energy & Power	4.7	1.8	0.9	1.3	0.2	1.2	2.6	12.7
Chemical Costs	-	3.6	8.1	7.5	-	-	-	19.2
Oil Disposal	-	-	-	-	0.5	-	-	0.5
TOTAL	45.3	32.8	30.9	31.2	2.7	74.6	40.8	258.3

	Effluent Quality(3)	Raw Waste Load	A	B	C	D	E	F	G	Total
	Flow, gal/ton	1200	1200	1200	1200	1200	1200	1200	1200	1200
	Total Susp. Solids	50	50	250						50
	Oil & Grease	40	40	40						15
	Hexavalent Chromium	1.0	1.0	1.0						0.02
	Dissolved Iron	50	50	2.0						1.0
	pH (Units)	2-10	4-8	6-9						6-9
115	Arsenic	0.1	0.1	0.1						0.1
119	Chromium, total	5	5	5						3
120	Copper	1.0	1.0	1.0						0.5
122	Lead	5	5	5						1.0
124	Nickel	0.6	0.6	0.6						0.5
128	Zinc	80	80	80						5

TABLE VIII-7
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory:	Hot Coating-Galvanizing	Model Size-TPD :	800
:	Strip/Sheet/Misc. Prod.	Oper. Days/Year:	260
:	Without Scrubbers	Turns/Day :	3

C&TT Steps	A E	B N_L	C CR	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $ x 10^{-3}	145	112	87	97	9	288	154	892
Annual Cost $ x 10^{-3}								
Capital	6.2	4.8	3.7	4.2	0.4	12.4	6.6	38.3
Depreciation	14.5	11.2	8.7	9.7	0.9	28.8	15.4	89.2
Operation & Maintenance	5.1	3.9	3.0	3.4	0.3	10.1	5.4	31.2
Sludge Disposal(2)	-	-	-	-	-	-	5.2	5.2
Energy & Power	2.3	1.2	0.5	1.0	0.2	0.9	2.2	8.3
Chemical Costs	-	1.8	4.1	3.7	-	-	-	9.6
Oil Disposal	-	-	-	-	0.5	-	-	0.5
TOTAL	28.1	22.9	20.0	22.0	2.3	52.2	34.8	182.3

Effluent Quality(3)	Raw Waste Load								
Flow, gal/ton	600	600	600	600	600	600	600	600	600
Total Susp. Solids	75	75	450						50
Oil & Grease	60	60	60						15
Hexavalent Chromium	2.0	2.0	2.0						0.02
Dissolved Iron	75	75	2.0						1.0
pH (Units)	2-9	3-8	6-9						6-9
115 Arsenic	0.2	0.2	0.2						0.1
119 Chromium, total	10	10	10						3
120 Copper	2	2	2						0.5
122 Lead	8	8	8						1.0
124 Nickel	1.0	1.0	1.0						0.5
128 Zinc	150	150	150						5

TABLE VIII-7
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Galvanizing
: Wire/Wire Products/Fasteners
: With Scrubbers

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	A E	B N_L	C CR	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $ x 10^{-3}	133	99	81	90	8	258	143	812
Annual Cost $ x 10^{-3}								
Capital	5.7	4.2	3.5	3.9	0.4	11.1	6.2	35.0
Depreciation	13.3	9.9	8.1	9.0	0.8	25.8	14.3	81.2
Operation & Maintenance	4.6	3.5	2.8	3.1	0.3	9.0	5.0	28.3
Sludge Disposal	-	-	-	-	-	-	2.5	2.5
Energy and Power(2)	2.3	0.8	0.4	0.7	0.1	0.9	1.7	6.9
Chemical Costs	-	1.5	3.3	3.0	-	-	-	7.8
Oil Disposal	-	-	-	-	0.1	-	-	0.1
TOTAL	25.9	19.9	18.1	19.7	1.7	46.8	29.7	161.8

Effluent Quality(3)	Raw Waste Load								
Flow, gal/ton	3900	3900	3900	3900	3900	3900	3900	3900	3900
Total Susp. Solids	100	100	250						50
Oil & Grease	25	25	25						15
Hexavalent Chromium	0.5	0.5	0.5						0.02
Dissolved Iron	40	40	2.0						1.0
pH (Units)	3-9	4-8	6-9						6-9
115 Arsenic	0.1	0.1	0.1						0.1
119 Chromium, total	1.0	1.0	1.0						1.0
120 Copper	0.4	0.4	0.4						0.4
122 Lead	1.0	1.0	1.0						1.0
124 Nickel	0.2	0.2	0.2						0.2
128 Zinc	20	20	20						5

TABLE VIII-7
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory:	Hot Coating-Galvanizing	Model Size-TPD :	100
:	Wire/Wire Products/Fasteners	Oper. Days/Year:	260
:	Without Scrubbers	Turns/Day :	3

C&TT Steps	A E	B N_L	C CR	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $\$ \times 10^{-3}$	92	74	62	72	8	202	111	621
Annual Cost $\$ \times 10^{-3}$								
Capital	3.9	3.2	2.7	3.1	0.4	8.7	4.8	26.8
Depreciation	9.2	7.4	6.2	7.2	0.8	20.2	11.1	62.1
Operation & Maintenance	3.2	2.6	2.2	2.5	0.3	7.1	3.9	21.8
Sludge Disposal	-	-	-	-	-	-	1.8	1.8
Energy and Power(2)	1.2	0.6	0.2	0.4	0.1	0.6	0.9	4.0
Chemical Costs	-	0.9	2.0	1.9	-	-	-	4.8
Oil Disposal	-	-	-	-	0.1	-	-	0.1
TOTAL	17.5	14.7	13.3	15.1	1.7	36.6	22.5	121.4

Effluent Quality(3)	Raw Waste Load	A	B	C	D	E	F	G	Total
Flow, gal/ton	2400	2400	2400	2400	2400	2400	2400	2400	2400
Total Susp. Solids	150	150	300						50
Oil & Grease	40	40	40						15
Hexavalent Chromium	1.0	1.0	1.0						0.02
Dissolved Iron	75	75	2.0						1.0
pH (Units)	3-9	4-8	6-9						6-9
115 Arsenic	0.2	0.2	0.2						0.1
119 Chromium, total	2.5	2.5	2.5						1.0
120 Copper	0.8	0.8	0.8						0.4
122 Lead	2.0	2.0	2.0						1.0
124 Nickel	0.5	0.5	0.5						0.2
128 Zinc	35	35	35						5

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(1) Components in tandem.
(2) Costs are all power.
(3) mg/l unless specified.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Chemical Reduction
D : Polymer Addition
E : Oil Skimming
F : Clarifier
G : Vacuum Filter

TABLE VIII-8

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Coating-Terne	Model Size-TPD :	365
:	Strip/Sheet	Oper. Days/Year:	260
:	With Scrubbers	Turns/Day :	3

C&TT Steps	A E	B N_L	C AE	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment \$ x 10^{-3}	143	110	100	95	8	273	109	838
Annual Cost \$ x 10^{-3}								
Capital	6.1	4.7	4.3	4.1	0.4	11.7	4.7	36.0
Depreciation	14.3	11.0	10.0	9.5	0.8	27.3	10.9	83.8
Operation & Maintenance	5.0	3.8	3.5	3.3	0.3	9.6	3.8	29.3
Sludge Disposal	-	-	-	-	-	-	1.9	1.9
Energy and Power(2)	2.3	0.9	0.9	0.8	0.1	0.9	0.9	6.8
Chemical Costs	-	1.7	-	3.4	-	-	-	5.1
Oil Disposal	-	-	-	-	0.1	-	-	0.1
TOTAL	27.7	22.1	18.7	21.1	1.7	49.5	22.2	163.0

	Effluent Quality(3)	Raw Waste Load	A	B	C	D	E	F	G	Total
	Flow, gal/ton	1200	1200	1200	1200	1200	1200	1200	1200	1200
	Total Susp. Solids	50	50	150						50
	Oil & Grease	25	25	25						15
	Hexavalent Chromium	0.02	0.02	0.02						0.02
	Dissolved Iron	50	50	2.0						1.0
	Tin	5	5	5						5
	pH (Units)	3-9	4-8	6-9						6-9
115	Arsenic	0.1	0.1	0.1						0.1
118	Cadmium	0.1	0.1	0.1						0.1
119	Chromium, total	3	3	3						2
120	Copper	0.5	0.5	0.5						0.3
122	Lead	0.5	0.5	0.5						0.5
124	Nickel	0.8	0.8	0.8						0.4
128	Zinc	1.0	1.0	1.0						0.5

TABLE VIII-8
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory:	Hot Coating-Terne	Model Size-TPD :	365
:	Strip/Sheet	Oper. Days/Year:	260
:	Without Scrubbers	Turns/Day :	3

C&TT Steps	A E	B N_L	C AE	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $\$$ x 10^{-3}	91	74	69	72	8	187	111	612
Annual Cost $\$$ x 10^{-3}								
Capital	3.9	3.2	3.0	3.1	0.4	8.1	4.8	26.5
Depreciation	9.1	7.4	6.9	7.2	0.8	18.7	11.1	61.2
Operation & Maintenance	3.2	2.6	2.4	2.5	0.3	6.6	3.9	21.5
Sludge Disposal	-	-	-	-	-	-	1.2	1.2
Energy and Power(2)	1.2	0.6	0.9	0.4	0.1	0.6	0.9	4.7
Chemical Costs	-	0.8	-	1.7	-	-	-	2.5
Oil Disposal	-	-	-	-	0.1	-	-	0.1
TOTAL	17.4	14.6	13.2	14.9	1.7	34.0	21.9	117.7

Effluent Quality(3)	Raw Waste Load	A	B	C	D	E	F	G	Total
Flow, gal/ton	600	600	600	600	600	600	600	600	600
Total Susp. Solids	75	75	200						50
Oil & Grease	40	40	40						15
Hexavalent Chromium	0.04	0.03	0.03						0.02
Dissolved Iron	75	75	2.0						1.0
Tin	10	10	10						5
pH (Units)	3-9	4-8	6-9						6-9
115 Arsenic	0.1	0.1	0.1						0.1
118 Cadmium	0.1	0.1	0.1						0.1
119 Chromium, total	5	5	5						2
120 Copper	1.0	1.0	1.0						0.3
122 Lead	1.0	1.0	1.0						0.5
124 Nickel	2.0	2.0	2.0						0.4
128 Zinc	2.0	2.0	2.0						0.5

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(1) Components in tandem.
(2) Costs are all power.
(3) mg/l unless specified.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Aeration
D : Polymer Addition
E : Oil Skimming
F : Clarifier
G : Vacuum Filter

TABLE VIII-9

BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Other Metallic Coatings
: Strip/Sheet/Misc. Products
: With Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

C&TT Steps	A E	B N_L	C AE	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment \$ x 10^{-3}	223	142	165	123	11	396	180	1240
Annual Cost \$ x 10^{-3}								
Capital	9.6	6.1	7.1	5.3	0.5	17.0	7.7	53.3
Depreciation	22.3	14.2	16.5	12.3	1.1	39.6	18.0	124.0
Operation & Maintenance	7.8	5.0	5.8	4.3	0.4	13.8	6.3	43.4
Sludge Disposal	-	-	-	-	-	-	4.8	4.8
Energy and Power(2)	3.1	1.2	1.5	0.9	0.2	0.8	1.3	9.0
Chemical Costs	-	2.3	-	4.7	-	-	-	7.0
Oil Disposal	-	-	-	-	0.5	-	-	0.5
TOTAL	42.8	28.8	30.9	27.5	2.7	71.2	38.1	242.0

Effluent Quality(3)	Raw Waste Load	A	B	C	D	E	F	G	Total
Flow, gal/ton	1200	1200	1200	1200	1200	1200	1200	1200	1200
Total Susp. Solids	250	250	320						50
Oil & Grease	50	50	50						15
Hexavalent Chromium	0.02	0.02	0.02						0.02
Dissovled Iron	20	20	2.0						1.0
Tin	5	5	5						3
Aluminum	25	25	25						5
pH (Units)	5-9	5-9	6-9						6-9
115 Arsenic	0.1	0.1	0.1						0.1
118 Cadmium	2.0	2.0	2.0						0.5
119 Chromium, total	0.2	0.2	0.2						0.2
120 Copper	0.5	0.5	0.5						0.3
122 Lead	1.5	1.5	1.5						0.5
124 Nickel	0.5	0.5	0.5						0.3
128 Zinc	5	5	5						3

TABLE VIII-9
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Other Metallic Coatings
: Strip/Sheet/Misc. Products
: Without Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

C&TT Steps	A E	B N_L	C AE	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment \$ x 10^{-3}	142	97	101	94	8	273	175	890
Annual Cost \$ x 10^{-3}								
Capital	6.1	4.2	4.3	4.0	0.4	11.7	7.5	38.2
Depreciation	14.2	9.7	10.1	9.4	0.8	27.3	17.5	89.0
Operation & Maintenance	5.0	3.4	3.5	3.3	0.3	9.6	6.1	31.2
Sludge Disposal	-	-	-	-	-	-	3.7	3.7
Energy and Power(2)	1.6	0.5	0.6	0.5	0.1	0.6	1.3	5.2
Chemical Costs	-	1.1	-	2.3	-	-	-	3.4
Oil Disposal	-	-	-	-	0.3	-	-	0.3
TOTAL	26.9	18.9	18.5	19.5	1.9	49.2	36.1	171.0

Effluent Quality(3)	Raw Waste Load								
Flow, gal/ton	600	600	600	600	600	600	600	600	600
Total Susp. Solids	400	400	500						50
Oil & Grease	60	60	60						15
Hexavalent Chromium	0.02	0.02	0.02						0.02
Dissolved Iron	30	30	2.0						1.0
Tin	8	8	8						3
Aluminum	30	30	30						5
pH (Units)	4-10	5-9	6-9						6-9
115 Arsenic	0.1	0.1	0.1						0.1
118 Cadmium	4.0	4.0	4.0						0.5
119 Chromium, total	0.2	0.2	0.2						0.2
120 Copper	1.0	1.0	1.0						0.3
122 Lead	2.5	2.5	2.5						0.5
124 Nickel	0.5	0.5	0.5						0.3
128 Zinc	8	8	8						3

TABLE VIII-9
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory:	Hot Coating-Other Metallic Coatings	Model Size-TPD :	15
:	Wire/Wire Products/Fasteners	Oper. Days/Year:	260
:	With Scrubbers	Turns/Day :	2

C&TT Steps	A E	B N_L	C AE	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $ x 10^{-3}	55	48	51	49	8	122	80	413
Annual Cost $ x 10^{-3}								
Capital	2.3	2.1	2.2	2.1	0.3	5.2	3.4	17.6
Depreciation	5.5	4.8	5.1	4.9	0.8	12.2	8.0	41.3
Operation & Maintenance	1.9	1.7	1.8	1.7	0.3	4.3	2.8	14.5
Sludge Disposal	-	-	-	-	-	-	0.3	0.3
Energy and Power(2)	0.4	0.2	0.4	0.2	-	0.2	0.2	1.6
Chemical Costs	-	0.2	-	0.5	-	-	-	0.7
Oil Disposal	-	-	-	-	-	-	-	-
TOTAL	10.1	9.0	9.5	9.4	1.4	21.9	14.7	76.0

Effluent Quality(3)	Raw Waste Load	A	B	C	D	E	F	G	Total
Flow, gal/ton	3900	3900	3900	3900	3900	3900	3900	3900	3900
Total Susp. Solids	100	100	150						50
Oil & Grease	25	25	25						15
Hexavalent Chromium	0.02	0.02	0.02						0.02
Dissolved Iron	12	12	2.0						1.0
Tin	3	3	3						3
Aluminum	12	12	12						5
pH (Units)	5-9	5-9	6-9						6-9
115 Arsenic	0.1	0.1	0.1						0.1
118 Cadmium	1.0	1.0	1.0						0.5
119 Chromium, total	0.8	0.8	0.8						0.5
120 Copper	0.3	0.3	0.3						0.3
122 Lead	1.0	1.0	1.0						0.5
124 Nickel	0.3	0.3	0.3						0.3
128 Zinc	3	3	3						3

TABLE VIII-9
BPT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory: Hot Coating-Other Metallic Coatings
: Wire/Wire Products/Fasteners
: Without Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

C&TT Steps		A E	B N_L	C AE	D FLP	E(1) SS	F(1) CL	G(1) VF	Total
Investment $ x 10^{-3}		41	36	41	39	8	97	79	341
Annual Cost $ x 10^{-3}									
Capital		1.7	1.6	1.8	1.7	0.3	4.1	3.4	14.6
Depreciation		4.1	3.6	4.1	3.9	0.8	9.7	7.9	34.1
Operation & Maintenance		1.4	1.3	1.4	1.4	0.3	3.4	2.8	12.0
Sludge Disposal		-	-	-	-	-	-	0.3	0.3
Energy & Power(2)		0.2	0.2	0.2	0.1	-	0.2	0.2	1.1
Chemical Costs		-	0.1	-	0.3	-	-	-	0.4
Oil Disposal		-	-	-	-	-	-	-	-
TOTAL		7.4	6.8	7.5	7.4	1.4	17.4	14.6	62.5
Effluent Quality(3)	Raw Waste Load								
Flow, gal/ton	2400	2400	2400	2400	2400	2400	2400	2400	2400
Total Susp. Solids	150	150	300						50
Oil & Grease	40	40	40						15
Hexavalent Chromium	0.03	0.03	0.03						0.02
Dissolved Iron	25	25	2.0						1.0
Tin	5	5	5						3
Aluminum	25	25	25						5
pH (Units)	5-9	5-9	6-9						6-9
115 Arsenic	0.1	0.1	0.1						0.1
118 Cadmium	2.0	2.0	2.0						0.5
119 Chromium, total	1.0	1.0	1.0						0.5
120 Copper	0.5	0.5	0.5						0.3
122 Lead	1.5	1.5	1.5						0.5
124 Nickel	0.5	0.5	0.5						0.3
128 Zinc	5	5	5						3

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(1) Components in tandem.
(2) Costs are all power.
(3) mg/l unless specified.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Aeration
D : Polymer Addition
E : Oil Skimming
F : Clarifier
G : Vacuum Filter

TABLE VIII-10

BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc.Products
: With Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	Alt. 1		Alt. 2				Alt. 3			
	H-1 FHR;CC	Total	H-1 FHR;CC	I(1) PS	J(1) FP	Total	H-1 FHR;CC	K EVC	L RTP100	Total
Investment \$ x 10^{-3}	265	265	265	28	135	428	265	2448	36	2749
Annual Cost \$ x 10^{-3}										
Capital	11.4	11.4	11.4	1.2	5.8	18.4	11.4	105.3	1.6	118.3
Depreciation	26.5	26.5	26.5	2.8	13.5	42.8	26.5	244.8	3.6	274.9
Operation & Maintenance	9.3	9.3	9.3	1.0	4.7	15.0	9.3	85.7	1.3	96.3
Sludge Disposal	-	-	-	-	-	-	-	-	-	-
Energy & Power(2)	1.7(4)	-	1.7(4)	0.1	0.5	0.6	1.7(4)	93.5	0.6(4)	93.5
Chemical Costs	-	-	-	0.7	-	0.7	-	-	-	-
Replacement Parts	24.7	24.7	24.7	-	-	24.7	24.7	-	-	24.7
TOTAL	71.9(4)	71.9	71.9(4)	5.8	24.5	102.2	71.9(4)	529.3	6.5(4)	607.7

Effluent Quality(3)	BAT Feed Quality	Alt. 1 Total	Alt. 2 Total	Alt. 3 Total
Flow, gal/ton	1200	200	200	0
Total Susp. Solids	50	30	15	-
Oil & Grease	15	5	5	-
Hexavalent Chromium	0.02	0.02	0.02	-
Dissolved Iron	1.0	0.2	0.3	-
pH, Units	6-9	6-9	6-9	-
115 Arsenic	0.1	0.1	0.1	-
119 Chromium, Total	3	0.1	0.1	-
120 Copper	0.5	0.1	0.1	-
122 Lead	1.0	0.1	0.1	-
124 Nickel	0.5	0.2	0.1	-
128 Zinc	5	0.1	0.1	-

TABLE VIII-10
BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc. Products
: No Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

		Alt. 1		Alt. 2				Alt. 3			
C&TT Step		H-2 CC	Total	H-2 CC	I[1] PS	J[1] FP	Total	H-2 CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}		188	188	188	28	117	333	188	2277	36	2501
Annual Cost $ x 10^{-3}											
Capital		8.1	8.1	8.1	1.2	5.0	14.3	8.1	97.9	1.5	107.5
Depreciation		18.8	18.8	18.8	2.8	11.7	33.3	18.8	227.7	3.6	250.1
Operation & Maintenance		6.6	6.6	6.6	1.0	4.1	11.7	65.6	79.7	1.2	87.5
Sludge Disposal[2]		-	-	-	-	-	-	-	-	-	-
Energy & Power		-	-	-	0.1	0.4	0.5	-	69.9	0.6[4]	69.9
Chemical Costs		-	-	-	0.5	-	0.5	-	-	-	-
Replacement Parts		24.7	24.7	24.7	-	-	24.7	24.7	-	-	24.7
TOTAL		58.2	58.2	58.2	5.6	21.2	85.0	58.2	475.2	6.3[4]	539.7
Effluent Quality[3]	BAT Feed Quality										
Flow, gal/ton	600		150				150				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.5				0.3				-
pH, Units	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
119 Chromium, Total	3		0.1				0.1				-
120 Copper	0.5		0.1				0.1				-
122 Lead	1.0		0.1				0.1				-
124 Nickel	0.5		0.2				0.1				-
128 Zinc	5		0.1				0.1				-

TABLE VIII-10
BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Galvanizing
: Wire/Wire Products/Fasteners
: With Scrubbers

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	BAT Feed Quality	Alt. 1		Alt. 2				Alt. 3			
		H-1 FHR;CC	Total	H-1 FHR;CC	I[(1)] PS	J[(1)] FP	Total	H-1 FHR;CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}		108	108	108	25	104	237	108	2027	29	2164
Annual Cost $ x 10^{-3}											
Capital		4.6	4.6	4.6	1.1	4.5	10.2	4.6	87.1	1.2	92.9
Depreciation		10.8	10.8	10.8	2.5	10.4	23.7	10.8	202.7	2.9	216.4
Operation & Maintenance		3.8	3.8	3.8	0.9	3.6	8.3	3.8	70.8	1.0	75.7
Sludge Disposal(2)		-	-	-	-	-	-	-	-	-	-
Energy & Power		0.6(4)	-	0.6(4)	0.1	0.3	0.4	0.6(4)	43.8	0.2(4)	43.8
Chemical Costs		-	-	-	0.3	-	0.3	-	-	-	-
Replacement Parts		7.1	7.1	7.1	-	-	7.1	7.1	-	-	7.1
TOTAL		26.3(4)	26.3	26.3(4)	4.9	18.8	50.0	26.3(4)	404.5	5.1(4)	435.9
Effluent Quality(3)	BAT Feed Quality										
Flow, gal/ton	3900		750				750				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
pH, Units	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
119 Chromium, Total	1.0		0.1				0.1				-
120 Copper	0.4		0.1				0.1				-
122 Lead	1.0		0.1				0.1				-
124 Nickel	0.2		0.2				0.1				-
128 Zinc	5		0.1				0.1				-

BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory: Hot Coating-Galvanizing
: Wire/Wire Products/Fasteners
: No Scrubbers

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Step	BAT Feed Quality	Alt. 1 H-2 CC	Alt. 1 Total	Alt. 2 H-2 CC	Alt. 2 I(1) PS	Alt. 2 J(1) FP	Alt. 2 Total	Alt. 3 H-2 CC	Alt. 3 K EVC	Alt. 3 L RTP100	Alt. 3 Total
Investment $\$ \times 10^{-3}$		54	54	54	23	97	174	54	1920	26	2000
Annual Cost $\$ \times 10^{-3}$											
Capital		2.3	2.3	2.3	1.0	4.2	7.5	2.3	82.6	1.1	86.0
Depreciation		5.4	5.4	5.4	2.3	9.7	17.4	5.4	192.0	2.6	200.0
Operation & Maintenance		1.9	1.9	1.9	0.8	3.4	6.1	1.9	67.2	0.9	70.0
Sludge Disposal		-	-	-	-	-	-	-	-	-	-
Energy & Power(2)		-	-	-	0.1	0.2	0.3	-	35.4	0.2(4)	35.4
Chemical Costs		-	-	-	0.3	-	0.3	-	-	-	-
Replacement Parts		7.1	7.1	7.1	-	-	7.1	7.1	-	-	7.1
TOTAL		16.7	16.7	16.7	4.5	17.5	38.7	16.7	377.2	4.6(4)	398.5
Effluent Quality(3)											
Flow, gal/ton	2400		600				600				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
pH, Units	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
119 Chromium, Total	1.0		0.1				0.1				-
120 Copper	0.5		0.1				0.1				-
122 Lead	1.0		0.1				0.1				-
124 Nickel	0.2		0.2				0.1				-
128 Zinc	5		0.1				0.1				-

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(1) Components used in tandem
(2) Costs are all power
(3) mg/l unless specified
(4) Total cost does not include power, because a credit is applied for existing process water needs.

KEY TO C&TT STEPS

H-1: Install counter current or cascade rinse system
Recycle fume hood scrubber with 8-10% blowdown
H-2: Install counter-current or cascade rinse system

I: Precipitation with sulfide
J: Filtration
K: Install vapor compression/evaporation system
L: Recycle distillate to process

TABLE VIII-11

BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Terne
: Strip/Sheet
: With Scrubbers

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

		Alt. 1		Alt. 2				Alt. 3			
C&TT Step		H-1 FHR;CC	Total	H-1 FHR;CC	I(1) FS	J(1) FP	Total	H-1 FHR;CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}		187	187	187	25	104	316	187	2016	29	2232
Annual Cost $ x 10^{-3}											
Capital		8.0	8.0	8.0	1.1	4.5	13.6	8.0	86.7	1.2	95.9
Depreciation		18.7	18.7	18.7	2.5	10.4	31.6	18.7	201.6	2.9	223.2
Operation & Maintenance		6.5	6.5	6.5	0.9	3.6	11.0	6.5	70.6	1.0	78.1
Sludge Disposal		-	-	-	-	-	-	-	-	-	-
Energy and Power(2)		0.9(4)	-	0.9(4)	0.1	0.3	0.4	0.4(4)	42.9	0.2(4)	42.9
Chemical Costs		-	-	-	0.3	-	0.3	-	-	-	-
Replacement Parts		15.5	15.5	15.5	-	-	15.5	15.5	-	-	15.5
TOTAL		48.7(4)	48.7	48.7(4)	4.9	18.8	72.4	48.7(4)	401.8	5.1(4)	455.6
Effluent Quality(3)	BAT Feed Quality										
Flow, gal/ton	1200		200				200				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
Tin	5		3				0.1				-
pH (Units)	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
118 Cadmium	0.1		0.1				0.1				-
119 Chromium, total	2		0.1				0.1				-
120 Copper	0.3		0.1				0.1				-
122 Lead	0.5		0.1				0.1				-
124 Nickel	0.4		0.2				0.1				-
128 Zinc	0.5		0.1				0.1				-

TABLE VIII-11
BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Terne
: Strip/Sheet
: Without Scrubbers

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

		Alt. 1		Alt. 2				Alt. 3			
C&TT Step		H-2 CC	Total	H-2 CC	I[(1)] PS	J[(1)] FP	Total	H-2 CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}		117	117	117	22	87	226	117	1874	26	2017
Annual Cost $ x 10^{-3}											
Capital		5.0	5.0	5.0	1.0	3.7	9.7	5.0	80.6	1.1	86.7
Depreciation		11.7	11.7	11.7	2.2	8.7	22.6	11.7	187.4	2.6	201.7
Operation & Maintenance		4.1	4.1	4.1	0.8	3.0	7.9	4.1	65.6	0.9	70.6
Sludge Disposal		-	-	-	-	-	-	-	-	-	-
Energy and Power(2)		-	-	-	0.1	0.2	0.3	-	32.0	0.2(4)	32.0
Chemical Costs		-	-	-	0.2	-	0.2	-	-	-	-
Replacement Parts		15.5	15.5	15.5	-	-	15.5	15.5	-	-	15.5
TOTAL		36.3	36.3	36.3	4.3	15.6	56.2	36.3	365.6	4.6(4)	406.5
Effluent Quality(3)	BAT Feed Quality										
Flow, gal/ton	600		150				150				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
Tin	5		3				0.1				-
pH (Units)	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
118 Cadmium	0.1		0.1				0.1				-
119 Chromium, total	2		0.1				0.1				-
120 Copper	0.3		0.1				0.1				-
122 Lead	0.5		0.1				0.1				-
124 Nickel	0.4		0.2				0.1				-
128 Zinc	0.5		0.1				0.1				-

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(1) Components used in tandem.
(2) Costs are all power.
(3) mg/l unless specified.
(4) Total cost does not include power, because a credit is applied for existing process water needs.

KEY TO C&TT STEPS

H-1: Install counter current or cascade rinse system
Recycle fume hood scrubber with 8-10% blowdown
H-2: Install counter-current or cascade rinse system

I: Precipitation with sulfide
J: Filtration
K: Install vapor compression/evaporation system
L: Recycle distillate to process

TABLE VIII-12

BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Other Metals
: Strip/Sheet/Misc. Products
: With Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

C&TT Step		Alt. 1		Alt. 2				Alt. 3			
		H-1 FHR;CC	Total	H-1 FHR;CC	I(1) FS	J(1) FP	Total	H-1 FHR;CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}		219	219	219	26	135	380	219	2409	36	2664
Annual Cost $ x 10^{-3}											
Capital		9.4	9.4	9.4	1.1	5.8	16.3	9.4	103.6	1.6	114.6
Depreciation		21.9	21.9	21.9	2.6	13.5	38.0	21.9	240.9	3.6	266.4
Operation & Maintenance		7.7	7.7	7.7	0.9	4.7	13.3	7.7	84.3	1.3	93.3
Sludge Disposal		-	-	-	-	-	-	-	-	-	-
Energy and Power(2)		1.2(4)	-	1.2(4)	0.1	0.3	0.4	1.2(4)	58.4	0.4(4)	58.4
Chemical Costs		-	-	-	0.4	-	0.4	-	-	-	-
Replacement Parts		18.7	18.7	18.7	-	-	18.7	18.7	-	-	18.7
TOTAL		57.7(4)	57.7(4)	57.7(4)	5.1	24.3	87.1	57.7(4)	487.2	6.5(4)	551.4
Effluent Quality(3)	BAT Feed Quality										
Flow, gal/ton	1200		200				200				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
Tin	3		1.5				0.1				-
Aluminum	5		2.5				0.1				-
pH (Units)	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
118 Cadmium	0.5		0.1				0.1				-
119 Chromium, total	0.2		0.1				0.1				-
120 Copper	0.3		0.1				0.1				-
122 Lead	0.5		0.1				0.1				-
124 Nickel	0.3		0.2				0.1				-
128 Zinc	3		0.1				0.1				-

TABLE VIII-12
BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Other Metallic Coatings
: Strip/Sheet/Misc. Products
: Without Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

		Alt. 1		Alt. 2				Alt. 3			
C&TT Step		H-2 CC	Total	H-2 CC	I[(1)] PS	J[(1)] FP	Total	H-2 CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}		141	141	141	25	117	283	141	2242	36	2419
Annual Cost $ x 10^{-3}											
Capital		6.1	6.1	6.1	1.1	5.0	12.2	6.1	96.4	1.5	104.0
Depreciation		14.1	14.1	14.1	2.5	11.7	28.3	14.1	224.2	3.6	241.9
Operation & Maintenance		4.9	4.9	4.9	0.9	4.1	9.9	4.9	78.5	1.2	84.6
Sludge Disposal		-	-	-	-	-	-	-	-	-	-
Energy and Power (2)		-	-	-	0.1	0.3	0.4	-	43.8	0.4(4)	43.8
Chemical Costs		-	-	-	0.3	-	0.3	-	-	-	-
Replacement Costs		18.7	18.7	18.7	-	-	18.7	18.7	-	-	18.7
TOTAL		43.8	43.8	43.8	4.9	21.1	69.8	43.8	442.9	6.3(4)	493.0
Effluent Quality(3)	BAT Feed Quality										
Flow, gal/ton	600		150				150				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
Tin	3		1.5				0.1				-
Aluminum	5		2.5				0.1				-
pH (Units)	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
118 Cadmium	0.5		0.1				0.1				-
119 Chromium, total	0.2		0.1				0.1				-
120 Copper	0.3		0.1				0.1				-
122 Lead	0.5		0.1				0.1				-
124 Nickel	0.3		0.2				0.1				-
128 Zinc	3		0.1				0.1				-

TABLE VIII-12
BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Other Metallic Coatings
: Wire/Wire Products/Fasteners
: With Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

		Alt. 1		Alt. 2				Alt. 3			
C&TT Step		H-1 FHR;CC	Total	H-1 FHR;CC	$I^{(1)}$ PS	$J^{(1)}$ FP	Total	H-1 FHR;CC	K EVC	L RTP100	Total
Investment $\$ \times 10^{-3}$		51	51	51	19	61	131	51	1404	20	1475
Annual Cost $\$ \times 10^{-3}$											
Capital		2.2	2.2	2.2	0.8	2.6	5.6	2.2	60.4	0.8	63.4
Depreciation		5.1	5.1	5.1	1.9	6.1	13.1	5.1	140.4	2.0	147.5
Operation & Maintenance		1.8	1.8	1.8	0.7	2.1	4.6	1.8	49.1	0.7	51.6
Sludge Disposal		-	-	-	-	-	-	-	-	-	-
Energy and Power(2)		0.1(4)	-	0.1(4)	0.1	0.1	0.2	0.1(4)	6.8	0.1(4)	6.8
Chemical Costs		-	-	-	0.1	-	0.1	-	-	-	-
Replacement Parts		2.3	2.3	2.3	-	-	2.3	2.3	-	-	2.3
TOTAL		11.4(4)	11.4(4)	11.4(4)	3.6	10.9	25.9	11.4(4)	256.7	3.5(4)	271.6
Effluent Quality(3)	BAT Feed Quality										
Flow, gal/ton	3900		750				750				0
Total Susp. Solids	50		30				15				-
Oil & Grease	15		5				5				-
Hexavalent Chromium	0.02		0.02				0.02				-
Dissolved Iron	1.0		0.2				0.2				-
Tin	3		1.5				0.1				-
Aluminum	5		2.5				0.1				-
pH (Units)	6-9		6-9				6-9				-
115 Arsenic	0.1		0.1				0.1				-
118 Cadmium	0.5		0.1				0.1				-
119 Chromium, total	0.5		0.1				0.1				-
120 Copper	0.3		0.1				0.1				-
122 Lead	0.5		0.1				0.1				-
124 Nickel	0.3		0.2				0.1				-
128 Zinc	3		0.1				0.1				-

TABLE VIII-12
BAT MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory: Hot Coating-Other Metallic Coatings
: Wire/Wire Products/Fasteners
: No Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

C&TT Step	Alt. 1		Alt. 2				Alt. 3			
	H-2 CC	Total	H-2 CC	I[(1)] PS	J[(1)] FP	Total	H-2 CC	K EVC	L RTP100	Total
Investment $ x 10^{-3}	17	17	17	19	57	93	17	1306	19	1342
Annual Cost $ x 10^{-3}										
Capital	0.7	0.7	0.7	0.8	2.4	3.9	0.7	56.2	0.8	57.7
Depreciation	1.7	1.7	1.7	1.9	5.7	9.3	1.7	130.6	1.9	134.2
Operation & Maintenance	0.6	0.6	0.6	0.7	2.0	3.3	0.6	45.7	0.7	47.0
Sludge Disposal	-	-	-	-	-	-	-	-	-	-
Energy & Power(2)	-	-	-	0.1	0.1	0.2	-	5.1	0.1(4)	5.1
Chemical Costs	-	-	-	0.1	-	0.1	-	-	-	-
Replacement Parts	2.3	2.3	2.3	-	-	2.3	2.3	-	-	2.3
TOTAL	5.3	5.3	5.3	3.6	10.2	19.1	5.3	237.6	3.4(4)	246.3

Effluent Quality(3)	BAT Feed Quality	Alt. 1 Total	Alt. 2 Total	Alt. 3 Total
Flow, gal/ton	2400	600	600	0
Total Susp. Solids	50	30	15	-
Oil & Grease	15	5	5	-
Hexavalent Chromium	0.02	0.02	0.02	-
Dissolved Iron	1.0	0.2	0.2	-
Tin	3	1.5	0.1	-
Aluminum	5	2.5	0.1	-
pH, Units	6-9	6-9	6-9	-
115 Arsenic	0.1	0.1	0.1	-
118 Cadmium	0.5	0.1	0.1	-
119 Chromium, Total	0.5	0.1	0.1	-
120 Copper	0.3	0.1	0.1	-
122 Lead	0.5	0.1	0.1	-
124 Nickel	0.3	0.2	0.1	-
128 Zinc	3	0.1	0.1	

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(1) Components used in tandem.
(2) Costs are all power.
(3) mg/l unless specified.
(4) Total cost does not include power, because a credit is applied for existing process water needs.

KEY TO C&TT STEPS

H-1: Install countercurrent or cascade rinse system
Recycle fume hood scrubber water with 5-10% blowdown
H-2: Install countercurrent or cascade rinse sytem

I: Precipitation with sulfide
J: Filtration
K: Install vapor compression/evaporation system
L: Recycle distillate to process

TABLE VIII-13

RESULTS OF BCT COST TEST
HOT COATING-GALVANIZING

	Strip/Sheet Misc. Prod.		Wire Prod. & Fasteners	
A. BAT/BCT Feed	w/scrub	no scrub	w/scrub	no scrub
Effluent concentration - conventional pollutants	65	65	65	65
Flows in MGD	0.96	0.48	0.39	0.24
Days/Year	260	260	260	260
lbs/Year of conventional pollutants	135,310	67,655	54,970	33,830
B. BCT-1				
Effluent concentration - conventional pollutants	35	35	35	35
Flows in MGD	0.16	0.12	0.075	0.060
Days/Year	260	260	260	260
lbs/Year of conventional pollutants	12,145	9110	5690	4555
lbs/Year of conventional pollutants removed by treatment	123,165	58,545	49,280	29,275
Annual cost of BCT-1($)	71,900	58,200	26,300	16,700
$/lb of conventional pollutants removed	0.58	0.99	0.53	0.57
Pass/Fail	Pass	Pass	Pass	Pass
C. BCT-2(1)				
Effluent concentration - conventional pollutants	20	20	20	20
Flows in MGD	0.16	0.12	0.075	0.060
Days/Year	260	260	260	260
lbs/Year of conventional pollutants	6940	5205	3255	2600
lbs/Year of conventional pollutants removed by treatment	128,370	62,450	51,715	31,230
Annual Cost of BCT-2($)	96,400	79,400	45,100	34,200
$/lb of conventional pollutants removed	0.75	1.27	0.87	1.10
Pass/Fail	Pass	Pass	Pass	Pass

TABLE VIII-13
RESULTS OF BCT COST TEST
HOT COATING-TERNE
PAGE 2

	Strip/Sheet/Miscellaneous Products Only	
	With Scrubbers	No Scrubbers
A. BAT/BCT Feed		
Effluent concentration - conventional pollutants	65	65
Flows in MGD	0.438	0.219
Days/Year	260	260
lbs/year of conventional pollutants	61,735	30,865
B. BCT-1		
Effluent concentration - conventional pollutants	35	35
Flows in MGD	0.073	0.055
Days/Year	260	260
lbs/year of conventional pollutants	5,540	4,175
lbs/year of conventional pollutants removed by treatment	56,195	26,690
Annual Cost of BCT-1($)	48,700	36,300
$/lb of conventional removed	0.87	1.36
Pass/Fail	Pass	Fail
C. BCT-2(2)		
Effluent concentration - conventional pollutants	20	20
Flow in MGD	0.073	0.055
Days/Year	260	260
lbs/year of conventional pollutants	3,165	2,385
lbs/year of conventional pollutants removed by treatment	58,570	28,480
Annual Cost of BCT-2	67,500	51,900
$/lb of conventional pollutants removed	1.15	1.82
Pass/Fail	Pass	Fail

TABLE VIII-13
RESULTS OF BCT COST TEST
HOT COATING-OTHER METALS
PAGE 3

	Strip/Sheet Misc. Prod.		Wire Prod. & Fasteners	
A. BAT/BCT Feed	w/scrub	no scrub	w/scrub	no scrub
Effluent concentration - conventional pollutants	65	65	65	65
Flows in MGD	0.600	0.300	0.0585	0.0360
Days/Year	260	260	260	260
lbs/year of conventional pollutants	84,570	42,285	8,245	5,075
B. BCT-1(3)				
Effluent concentration - conventional pollutants	35	35	35	35
Flows in MGD	0.100	0.075	0.0113	0.0090
Days/Year	260	260	260	260
lbs/year of conventional pollutants	7,590	5,690	860	685
lbs/year of conventional pollutants removed by treatment	76,980	36,595	7,385	4,390
Annual Cost of BCT-1($)	57,700	43,800	11,400	5,300
$/lb of conventional pollutants removed	0.75	1.20	1.54	1.21
Pass/Fail	Pass	Pass	Fail	Pass
C. BCT-2(4)				
Effluent concentration - conventional pollutants	20	20	20	20
Flows in MGD	0.100	0.075	0.0113	0.0090
Days/Year	260	260	260	260
lbs/year of conventional pollutants	4,335	3,255	490	390
lbs/year of conventional pollutants removed by treatment	80,235	39,030	7,755	4,685
Annual Cost of BCT-2($)	82,000	64,900	22,300	15,500
$/lb of conventional pollutants removed	1.02	1.66	2.88	3.31
Pass/Fail	Pass	Fail	Fail	Fail

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(1) Selected BCT Alternative.

(2) Selected BCT Alternative for lines with scrubbers only. Lines with no scrubbers have BCT limitations based on BPT.

(3) Selected BCT Alternative for lines with no scrubbers only.

(4) Selected BCT Alternative for strip, sheet and miscellaneous product lines with scrubbers only. Wire product and fastener lines with scrubbers have BCT limitations based on BPT.

TABLE VIII-14

NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc. Product
: With Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

	Alternative #1										Alternative #2		
C&TT Steps	A	B	C	D	E	F	G(1)	H(1)	I	Total	J(1)	K(1)	Total
Investment $ x 10^{-3}	188	172	116	93	95	8	312	136	77	1197	28	135	1360
Annual Cost $ x 10^{-3}													
Capital	8.1	7.4	5.0	4.0	4.1	0.4	13.4	5.8	3.5	51.5	1.2	5.8	58.5
Depreciation	18.8	17.2	11.6	9.3	9.5	0.8	31.2	13.6	7.7	119.7	2.8	13.5	136.0
Operation and Maintenance	6.6	6.0	4.1	3.2	3.3	0.3	10.9	4.8	2.7	41.9	1.0	4.7	47.6
Sludge Disposal	-	-	-	-	-	-	-	6.2	-	6.2	-	-	6.2
Energy and Power(2)	-	3.0	1.2	0.6	0.8	0.2	0.8	1.7	1.7	10.0	0.1	0.5	10.6
Chemical Costs	-	-	2.4	5.1	4.7	-	-	-	-	12.2	0.7	-	12.9
Oil Disposal	-	-	-	-	-	0.5	-	-	-	0.5	-	-	0.5
Expendable Parts	24.7	-	-	-	-	-	-	-	-	24.7	-	-	24.7
TOTAL	58.2	33.6	24.3	22.2	22.4	2.2	56.3	32.1	15.4	266.7	5.8	24.5	297.0

Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	1200	200	200
Suspended Solids	50	30	15
Oil and Grease	40	5	5
Hexavalent Chromium	1.0	0.02	0.02
Dissolved Iron	50	0.2	0.2
pH (Units)	2-10	6-9	6-9
115 Arsenic	0.1	0.1	0.1
119 Chromium	5	0.1	0.1
120 Copper	1.0	0.1	0.1
122 Lead	5	0.1	0.1
124 Nickel	0.6	0.2	0.1
128 Zinc	80	0.1	0.1

TABLE VIII-14
NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc. Product
: Without Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

	Alternative #1									Alternative #2		
C&TT Steps	A	B	C	D	E	F	G$^{(1)}$	H$^{(1)}$	Total	J$^{(1)}$	K$^{(1)}$	Total
Investment $\$ \times 10^{-3}$	188	63	49	38	42	4	125	67	576	28	117	721
Annual Cost $\$ \times 10^{-3}$												
Capital	8.1	2.7	2.1	1.6	1.8	0.2	5.4	2.9	24.8	1.2	5.0	31.0
Depreciation	18.8	6.3	4.9	3.8	4.2	0.4	12.5	6.7	57.6	2.8	11.7	72.1
Operation and Maintenance	6.6	2.2	1.7	1.3	1.5	0.1	4.4	2.3	20.1	1.0	4.1	25.2
Sludge Disposal	-	-	-	-	-	-	-	5.2	5.2	-	-	5.2
Energy and Power$^{(2)}$	-	1.2	0.5	0.3	0.4	0.1	0.3	0.7	3.5	0.1	0.4	4.0
Chemical Costs	-	-	0.9	2.1	1.9	-	-	-	4.9	0.5	-	5.4
Oil Disposal	-	-	-	-	-	0.5	-	-	0.5	-	-	0.5
Expendable Parts	24.7	-	-	-	-	-	-	-	24.7	-	-	24.7
TOTAL	58.2	12.4	10.1	9.1	9.8	1.3	22.6	17.8	141.3	5.6	21.2	168.1

	Effluent Quality$^{(3)}$	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
	Flow, gal/ton	600	150	150
	Suspended Solids	75	30	15
	Oil and Grease	60	5	5
	Hexavalent Chromium	2.0	0.02	0.02
	Dissolved Iron	75	0.2	0.2
	pH (Units)	2-9	6-9	6-9
115	Arsenic	0.2	0.1	0.1
119	Chromium	10	0.1	0.1
120	Copper	2	0.1	0.1
122	Lead	8	0.1	0.1
124	Nickel	1.0	0.2	0.1
128	Zinc	150	0.1	0.1

TABLE VIII-14
NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Galvanizing
: Wire Products and Fasteners
: With Scrubbers

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

	Alternative #1										Alternative #2		
C&TT Steps	A	B	C	D	E	F	G$^{(1)}$	H$^{(1)}$	I	Total	J$^{(1)}$	K$^{(1)}$	Total
Investment $ x 10^{-3}	54	92	68	56	62	6	178	99	54	669	25	104	798
Annual Cost $ x 10^{-3}													
Capital	2.3	3.9	2.9	2.4	2.7	0.3	7.6	4.3	2.3	28.7	1.1	4.5	34.3
Depreciation	5.4	9.2	6.8	5.6	6.2	0.6	17.8	9.9	5.4	66.9	2.5	10.4	79.8
Operation and Maintenance	1.9	3.2	2.4	2.0	2.2	0.2	6.2	3.4	1.9	23.4	0.9	3.6	27.9
Sludge Disposal	-	-	-	-	-	-	-	2.5	-	2.5	-	-	2.5
Energy and Power$^{(2)}$	-	1.3	0.5	0.3	0.4	0.1	0.5	1.0	0.6	4.7	0.1	0.3	5.1
Chemical Costs	-	-	0.9	1.8	1.7	-	-	-	-	4.4	0.3	-	4.7
Oil Disposal	-	-	-	-	-	0.1	-	-	-	0.1	-	-	0.1
Expendable Parts	7.1	-	-	-	-	-	-	-	-	7.1	-	-	7.1
TOTAL	16.7	17.6	13.5	12.1	13.2	1.3	32.1	21.1	10.2	137.8	4.9	18.8	161.5

Effluent Quality$^{(3)}$	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	3900	750	750
Suspended Solids	100	30	15
Oil and Grease	25	5	5
Hexavalent Chromium	0.5	0.02	0.02
Dissolved Iron	40	0.2	0.2
pH (Units)	3-9	6-9	6-9
115 Arsenic	0.1	0.1	0.1
119 Chromium	1.0	0.1	0.1
120 Copper	0.4	0.1	0.1
122 Lead	1.0	0.1	0.1
124 Nickel	0.2	0.2	0.1
128 Zinc	20	0.1	0.1

TABLE VIII-14
NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory: Hot Coating-Galvanizing
: Wire Products and Fasteners
: Without Scrubbers

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	Alternative #1 A	B	C	D	E	F	G(1)	H(1)	Total	Alternative #2 J(1)	K(1)	Total
Investment $ x 10^{-3}	54	40	32	27	31	3	88	48	323	23	97	443
Annual Cost $ x 10^{-3}												
Capital	2.3	1.7	1.4	1.2	1.3	0.1	3.8	2.1	13.9	1.0	4.2	19.1
Depreciation	5.4	4.0	3.2	2.7	3.1	0.3	8.8	4.8	32.3	2.3	9.7	44.3
Operation and Maintenance	1.9	1.4	1.1	0.9	1.1	0.1	3.1	1.7	11.3	0.8	3.4	15.5
Sludge Disposal	-	-	-	-	-	-	-	1.8	1.8	-	-	1.8
Energy and Power(2)	-	0.3	0.2	0.1	0.1	0.1	0.2	0.3	1.3	0.1	0.2	1.6
Chemical Costs	-	-	0.3	0.5	0.5	-	-	-	1.3	0.3	-	1.6
Oil Disposal	-	-	-	-	-	0.1	-	-	0.1	-	-	0.1
Expendable Parts	7.1	-	-	-	-	-	-	-	7.1	-	-	7.1
TOTAL	16.7	7.4	6.2	5.4	6.1	0.7	15.9	10.7	69.1	4.5	17.5	91.1

Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	2400	600	600
Suspended Solids	150	30	15
Oil and Grease	40	5	5
Hexavalent Chromium	1.0	0.02	0.02
Dissolved Iron	75	0.2	0.2
pH (Units)	3-9	6-9	6-9
115 Arsenic	0.2	0.1	0.1
119 Chromium	2.5	0.1	0.1
120 Copper	0.8	0.1	0.1
122 Lead	2.0	0.1	0.1
124 Nickel	0.5	0.2	0.1
128 Zinc	35	0.1	0.1

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(1) Components are used in tandem.
(2) Costs are all power.
(3) All values are in mg/l unless otherwise specified.

KEY TO C&TT STEPS

A: Install cascade or counter-current rinse system.
B: Equalization
C: Adjust pH to 6-9 with lime
D: Chemical Reduction
E: Polymer Addition
F: Oil Skimming
G: Flocculator/Clarifier
H: Vacuum filtration of thickener underflow
I: Recycle fume hood scrubber waters, with 8-10% blowdown
J: Precipitation with sulfide
K: Filtration

TABLE VIII-15

NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Terne
: Strip/Sheet
: With Scrubbers

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	Alternative #1 A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	I	Total	Alternative #2 $J^{(1)}$	$K^{(1)}$	Total
Investment \$ x 10^{-3}	117	108	83	75	72	6	206	82	70	819	25	104	948
Annual Cost \$ x 10^{-3}													
Capital	5.0	4.6	3.6	3.2	3.1	0.3	8.9	3.5	3.0	35.2	1.1	4.5	40.8
Depreciation	11.7	10.8	8.3	7.5	7.2	0.6	20.6	8.2	7.0	81.9	2.5	10.4	94.8
Operation and Maintenance	4.1	3.8	2.9	2.6	2.5	0.2	7.2	2.9	2.5	28.7	0.9	3.6	33.2
Sludge Disposal (2)	-	-	-	-	-	-	-	1.9	-	1.9	-	-	1.9
Energy and Power	-	1.5	0.6	0.6	0.5	0.1	0.6	0.6	0.9	5.4	0.1	0.3	5.8
Chemical Costs	-	-	1.1	-	2.2	-	-	-	-	3.3	0.3	-	3.6
Oil Disposal	-	-	-	-	-	0.1	-	-	-	0.1	-	-	0.1
Expendable Parts	15.5	-	-	-	-	-	-	-	-	15.5	-	-	15.5
TOTAL	36.3	20.7	16.5	13.9	15.5	1.3	37.3	17.1	13.4	172.0	4.9	18.8	195.7

	Effluent Quality$^{(3)}$	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
	Flow, gal/ton	1200	200	200
	Suspended Solids	50	30	15
	Oil and Grease	25	5	5
	Hexavalent Chromium	0.02	0.02	0.02
	Dissolved Iron	50	0.2	0.2
	Tin	5	3	0.1
	pH (Units)	3-9	6-9	6-9
115	Arsenic	0.1	0.1	0.1
118	Cadmium	0.1	0.1	0.1
119	Chromium	3	0.1	0.1
120	Copper	0.5	0.1	0.1
122	Lead	0.5	0.1	0.1
124	Nickel	0.8	0.2	0.1
128	Zinc	1.0	0.1	0.1

TABLE VIII-15
NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Terne
: Strip/Sheet
: Without Scrubbers

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	Alternative #1									Alternative #2		
	A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	Total	$J^{(1)}$	$K^{(1)}$	Total
Investment $ x 10^{-3}	117	40	32	30	31	3	81	48	382	22	87	491
Annual Cost $ x 10^{-3}												
Capital	5.0	1.7	1.4	1.3	1.3	0.1	3.5	2.1	16.4	1.0	3.7	21.1
Depreciation	11.7	4.0	3.2	3.0	3.1	0.3	8.1	4.8	38.2	2.2	8.7	49.1
Operation and Maintenance	4.1	1.4	1.1	1.1	1.1	0.1	2.8	1.7	13.4	0.8	3.0	17.2
Sludge Disposal	-	-	-	-	-	-	-	1.2	1 2	-	-	1.2
Energy and Power[2]	-	0.3	0.2	0.3	0.1	0.1	0.2	0.3	1.5	0.1	0.2	1.8
Chemical Costs	-	-	0.2	-	0.5	-	-	-	0.7	0.2	-	0.9
Oil Disposal	-	-	-	-	-	0.1	-	-	0.1	-	-	0.1
Expendable Parts	15.5	-	-	-	-	-	-	-	15.5	-	-	15.5
TOTAL	36.3	7.4	6.1	5.7	6.1	0.7	14.6	10.1	87.0	4.3	15.6	106.9

	Effluent Quality[3]	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
	Flow, gal/ton	600	150	150
	Suspended Solids	75	30	15
	Oil and Grease	40	5	5
	Hexavalent Chromium	0.04	0.02	0.02
	Dissolved Iron	75	0.2	0.2
	Tin	10	3	0.1
	pH (Units)	3-9	6-9	6-9
115	Arsenic	0.1	0.1	0.1
118	Cadmium	0.1	0.1	0.1
119	Chromium	5	0.1	0.1
120	Copper	1.0	0.1	0.1
122	Lead	1.0	0.1	0.1
124	Nickel	2.0	0.2	0.1
128	Zinc	2.0	0.1	0.1

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(1) Components are used in tandem.
(2) Costs are all power.
(3) All values are in mg/l unless otherwise specified.

KEY TO C&TT STEPS

A: Install cascade or counter-current rinse system.
B: Equalization
C: Adjust pH to 6-9 with lime
D: Aeration
E: Polymer Addition
F: Oil Skimming
G: Flocculator/Clarifier
H: Vacuum filtration of thickener underflow
I: Recycle fume hood scrubber waters, with 8-10% blowdown
J: Precipitation with sulfide
K: Filtration

TABLE VIII-16

NSPS MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Other Metallic Coatings
: Strip/Sheet/Misc. Products
: With Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

C&TT Steps	Alternative #1 A	B	C	D	E	F	G(1)	H(1)	I	Total	Alternative #2 J(1)	K(1)	Total
Investment $ x 10^{-3}	141	168	107	124	93	8	299	136	78	1154	26	135	1315
Annual Cost $ x 10^{-3}													
Capital	6.1	7.1	4.6	5.3	4.0	0.3	12.8	5.8	3.4	49.6	1.1	5.8	56.5
Depreciation	14.1	16.8	10.7	12.4	9.3	0.8	29.9	13.6	7.8	115.4	2.6	13.5	131.5
Operation and Maintenance	4.9	5.9	3.7	4.3	3.3	0.3	10.5	4.8	2.7	40.4	0.9	4.7	46.0
Sludge Disposal	-	-	-	-	-	-	-	4.8	-	4.8	-	-	4.8
Energy and Power(2)	-	2.0	0.8	1.0	0.6	0.2	0.5	0.9	1.2	7.2	0.1	0.3	7.6
Chemical Costs	-	-	1.5	-	3.0	-	-	-	-	4.5	0.4	-	4.9
Oil Disposal	-	-	-	-	-	0.5	-	-	-	0.5	-	-	0.5
Expendable Parts	18.7	-	-	-	-	-	-	-	-	18.7	-	-	18.7
TOTAL	43.8	31.9	21.3	23.0	20.2	2.1	53.8	29.9	15.1	241.1	5.1	24.3	270.5

	Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
	Flow, gal/ton	1200	200	200
	Suspended Solids	250	30	15
	Oil and Grease	50	5	5
	Hexavalent Chromium	0.02	0.02	0.02
	Dissolved Iron	20	0.2	0.2
	Tin	5	1.5	0.1
	Aluminum	25	2.5	0.1
	pH (Units)	5-9	6-9	6-9
115	Arsenic	0.1	0.1	0.1
118	Cadmium	2.0	0.1	0.1
119	Chromium	0.2	0.1	0.1
120	Copper	0.5	0.1	0.1
122	Lead	1.5	0.1	0.1
124	Nickel	0.5	0.2	0.1
128	Zinc	5	0.1	0.1

NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Other Metallic Coating
: Strip/Sheet/Misc. Products
: Without Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

		Alternative #1									Alternative #2		
C&TT Steps		A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	Total	$J^{(1)}$	$K^{(1)}$	Total
Investment $ x 10^{-3}		141	62	42	44	41	3	119	76	528	25	117	670
Annual Cost $ x 10^{-3}													
Capital		6.1	2.7	1.8	1.9	1.7	0.1	5.1	3.3	22.7	1.1	5.0	28.8
Depreciation		14.1	6.2	4.2	4.4	4.1	0.3	11.9	7.6	52.8	2.5	11.7	67.0
Operation and Maintenance		4.9	2.2	1.5	1.5	1.4	0.1	4.2	2.7	18.5	0.9	4.1	23.5
Sludge Disposal		-	-	-	-	-	-	-	3.7	3.7	-	-	3.7
Energy and Power$^{(2)}$		-	0.4	0.2	0.2	0.2	0.1	0.2	0.4	1.7	0.1	0.3	2.1
Chemical Costs		-	-	0.3	-	0.6	-	-	-	0.9	0.3	-	1.2
Oil Disposal		-	-	-	-	-	0.3	-	-	0.3	-	-	0.3
Expendable Parts		18.7	-	-	-	-	-	-	-	18.7	-	-	18.7
TOTAL		43.8	11.5	8.0	8.0	8.0	0.9	21.4	17.7	119.3	4.9	21.1	145.3
Effluent Quality$^{(3)}$	Raw Waste Load												
Flow, gal/ton	600									150			150
Suspended Solids	400									30			15
Oil and Grease	60									5			5
Hexavalent Chromium	0.02									0.02			0.02
Dissolved Iron	30									0.2			0.2
Tin	8									1.5			0.1
Aluminum	30									2.5			0.1
pH (Units)	4-10									6-9			6-9
115 Arsenic	0.1									0.1			0.1
118 Cadmium	4.0									0.1			0.1
119 Chromium	0.2									0.1			0.1
120 Copper	1.0									0.1			0.1
122 Lead	2.5									0.1			0.1
124 Nickel	0.5									0.2			0.1
128 Zinc	8									0.1			0.1

TABLE VIII-16
NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Other Metallic Coating
: Wire Products and Fasteners
: With Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

	Alternative #1										Alternative #2		
C&TT Steps	A	B	C	D	E	F	G$^{(1)}$	H$^{(1)}$	I	Total	J$^{(1)}$	K$^{(1)}$	Total
Investment \$ x 10^{-3}	17	38	33	35	34	6	84	55	34	336	19	61	416
Annual Cost \$ x 10^{-3}													
Capital	0.7	1.6	1.4	1.5	1.5	0.3	3.6	2.4	1.5	14.5	0.8	2.6	17.9
Depreciation	1.7	3.8	3.3	3.5	3.4	0.6	8.4	5.5	3.4	33.6	1.9	6.1	41.6
Operation and Maintenance	0.6	1.3	1.2	1.2	1.2	0.2	3.0	1.9	1.2	11.8	0.7	2.1	14.6
Sludge Disposal	-	-	-	-	-	-	-	0.3	-	0.3	-	-	0.3
Energy and Power$^{(2)}$	-	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.1	1.6	0.1	0.1	1.8
Chemical Costs	-	-	0.2	-	0.3	-	-	-	-	0.5	0.1	-	0.6
Oil Disposal	-	-	-	-	-	0.1	-	-	-	0.1	-	-	0.1
Expendable Parts	2.3	-	-	-	-	-	-	-	-	2.3	-	-	2.3
TOTAL	5.3	7.0	6.3	6.5	6.6	1.3	15.2	10.3	6.2	64.7	3.6	10.9	79.2

	Effluent Quality$^{(3)}$	Raw Waste Load	Total	Total
	Flow, gal/ton	3900	750	750
	Suspended Solids	100	30	15
	Oil and Grease	25	5	5
	Hexavalent Chromium	0.02	0.02	0.02
	Dissolved Iron	12	0.2	0.2
	Tin	3	1.5	0.1
	Aluminum	12	2.5	0.1
	pH (Units)	5-9	6-9	6-9
115	Arsenic	0.1	0.1	0.1
118	Cadmium	1.0	0.1	0.1
119	Chromium	0.8	0.1	0.1
120	Copper	0.3	0.1	0.1
122	Lead	1.0	0.1	0.1
124	Nickel	0.3	0.2	0.1
128	Zinc	3	0.1	0.1

TABLE VIII-16
NSPS AND PSNS MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory: Hot Coating-Other Metallic Coating
: Wire Products and Fasteners
: Without Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

	Alternative #1									Alternative #2		
C&TT Steps	A	B	C	D	E	F	G(1)	H(1)	Total	J(1)	K(1)	Total
Investment $ x 10^{-3}	17	18	16	18	17	3	42	34	165	19	57	241
Annual Cost $ x 10^{-3}												
Capital	0.7	0.8	0.7	0.8	0.7	0.1	1.8	1.5	7.1	0.8	2.5	10.4
Depreciation	1.7	1.8	1.6	1.8	1.7	0.3	4.2	3.4	16.5	1.9	5.7	24.1
Operation and Maintenance	0.6	0.6	0.6	0.6	0.6	0.1	1.5	1.2	5.8	0.7	2.0	8.5
Sludge Disposal	-	-	-	-	-	-	-	0.3	0.3	-	-	0.3
Energy and Power(2)	-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.7	0.1	0.1	0.9
Chemical Costs	-	-	0.1	-	0.1	-	-	-	0.2	0.1	-	0.3
Oil Disposal	-	-	-	-	-	0.1	-	-	0.1	-	-	0.1
Expendable Parts	2.3	-	-	-	-	-	-	-	2.3	-	-	2.3
TOTAL	5.3	3.3	3.1	3.3	3.2	0.7	7.6	6.5	33.0	3.6	10.3	46.9

	Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
	Flow, gal/ton	2400	600	600
	Suspended Solids	150	30	15
	Oil and Grease	40	5	5
	Hexavalent Chromium	0.03	0.02	0.02
	Dissolved Iron	25	0.2	0.2
	Tin	5	1.5	0.1
	Aluminum	25	2.5	0.1
	pH (Units)	5-9	6-9	6-9
115	Arsenic	0.1	0.1	0.1
118	Cadmium	2.0	0.1	0.1
119	Chromium	1.0	0.1	0.1
120	Copper	0.5	0.1	0.1
122	Lead	1.5	0.1	0.1
124	Nickel	0.5	0.2	0.1
128	Zinc	5	0.1	0.1

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(1) Components are used in tandem.
(2) Costs are all power.
(3) All values are in mg/l unless otherwise specified.

KEY TO C&TT STEPS

A: Install cascade or counter-current rinse system.
B: Equalization
C: Adjust pH to 6-9 with lime
D: Aeration
E: Polymer Addition
F: Oil Skimming
G: Flocculator/Clarifier
H: Vacuum filtration of thickener underflow
I: Recycle fume hood scrubber waters, with 8-10% blowdown
J: Precipitation with sulfide
K: Filtration

TABLE VIII-17

PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc. Product
: With Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	Raw Waste Load	A	B	C	D	E	F	G(1)	H(1)	I	Total	J(1)	K(1)	Total
		Alternative #1										Alternative #2		
Investment $ x 10^{-3}		188	172	116	93	95	8	312	136	77	1197	28	135	1360
Annual Cost $ x 10^{-3}														
Capital		8.1	7.4	5.0	4.0	4.1	0.4	13.4	5.8	3.3	51.5	1.2	5.8	58.5
Depreciation		18.8	17.2	11.6	9.3	9.5	0.8	31.2	13.6	7.7	119.7	2.8	13.5	136.0
Operation and Maintenance		6.6	6.0	4.1	3.2	3.3	0.3	10.9	4.8	2.7	41.9	1.0	4.7	47.6
Sludge Disposal		-	-	-	-	-	-	-	6.2	-	6.2	-	-	6.2
Energy and Power(2)		-	3.0	1.2	0.6	0.8	0.2	0.8	1.7	1.7(4)	8.3	0.1	0.5	8.9
Chemical Costs		-	-	2.4	5.1	4.7	-	-	-	-	12.2	0.7	-	12.9
Oil Disposal		-	-	-	-	-	0.5	-	-	-	0.5	-	-	0.5
Expendable Parts		24.7	-	-	-	-	-	-	-	-	24.7	-	-	24.7
TOTAL		58.2	33.6	24.3	22.2	22.4	2.2	56.3	32.1	13.7(4)	265.0	5.8	24.5	295.3
Effluent Quality(3)														
Flow, gal/ton	1200										200			200
Suspended Solids	50										30			15
Oil and Grease	40										5			5
Hexavalent Chromium	1.0										0.02			0.02
Dissolved Iron	50										0.2			0.2
pH (Units)	2-10										6-9			6-9
115 Arsenic	0.1										0.1			0.1
119 Chromium	5										0.1			0.1
120 Copper	1.0										0.1			0.1
122 Lead	5										0.1			0.1
124 Nickel	0.6										0.2			0.1
128 Zinc	80										0.1			0.1

TABLE VIII-17
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Galvanizing
: Strip/Sheet/Misc. Product
: Without Scrubbers

Model Size-TPD : 800
Oper. Days/Year: 260
Turns/Day : 3

	Alternative #1									Alternative #2		
C&TT Steps	A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	Total	$J^{(1)}$	$K^{(1)}$	Total
Investment $ x 10^{-3}	188	63	49	38	42	4	125	67	576	28	117	721
Annual Cost $ x 10^{-3}												
Capital	8.1	2.7	2.1	1.6	1.8	0.2	5.4	2.9	24.8	1.2	5.0	31.0
Depreciation	18.8	6.3	4.9	3.8	4.2	0.4	12.5	6.7	57.6	2.8	11.7	72.1
Operation and Maintenance	6.6	2.2	1.7	1.3	1.5	0.1	4.4	2.3	20.1	1.0	4.1	25.2
Sludge Disposal	-	-	-	-	-	-	-	5.2	5.2	-	-	5.2
Energy and Power[(2)]	-	1.2	0.5	0.3	0.4	0.1	0.3	0.7	3.5	0.1	0.4	4.0
Chemical Costs	-	-	0.9	2.1	1.9	-	-	-	4.9	0.5	-	5.4
Oil Disposal	-	-	-	-	-	0.5	-	-	0.5	-	-	0.5
Expendable Parts	24.7	-	-	-	-	-	-	-	24.7	-	-	24.7
TOTAL	58.2	12.4	10.1	9.1	9.8	1.3	22.6	17.8	141.3	5.6	21.2	168.1

	Effluent Quality[(3)]	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
	Flow, gal/ton	600	150	150
	Suspended Solids	75	30	15
	Oil and Grease	60	5	5
	Hexavalent Chromium	2.0	0.02	0.02
	Dissolved Iron	75	0.2	0.2
	pH (Units)	2-9	6-9	6-9
115	Arsenic	0.2	0.1	0.1
119	Chromium	10	0.1	0.1
120	Copper	2	0.1	0.1
122	Lead	8	0.1	0.1
124	Nickel	1.0	0.2	0.1
128	Zinc	150	0.1	0.1

TABLE VIII-17
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Galvanizing
: Wire Products and Fasteners
: With Scrubbers

Model Size-TPD : 100
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	Alternative #1 A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	I	Total	Alternative #2 $J^{(1)}$	$K^{(1)}$	Total
Investment $ x 10^{-3}	54	92	68	56	62	6	178	99	54	669	25	104	798
Annual Cost $ x 10^{-3}													
Capital	2.3	3.9	2.9	2.4	2.7	0.3	7.6	4.3	2.3	28.7	1.1	4.5	34.3
Depreciation	5.4	9.2	6.8	5.6	6.2	0.6	17.8	9.9	5.4	66.9	2.5	10.4	79.8
Operation and Maintenance	1.9	3.2	2.4	2.0	2.2	0.2	6.2	3.4	1.9	23.4	0.9	3.6	27.9
Sludge Disposal	-	-	-	-	-	-	-	2.5	-	2.5	-	-	2.5
Energy and Power(2)	-	1.3	0.5	0.3	0.4	0.1	0.5	1.0	0.6(4)	4.1	0.1	0.3	4.5
Chemical Costs	-	-	0.9	1.8	1.7	-	-	-	-	4.4	0.3	-	4.7
Oil Disposal	-	-	-	-	-	0.1	-	-	-	0.1	-	-	0.1
Expendable Parts	7.1	-	-	-	-	-	-	-	-	7.1	-	-	7.1
TOTAL	16.7	17.6	13.5	12.1	13.2	1.3	32.1	21.1	9.6(4)	137.2	4.9	18.8	160.9

	Effluent Quality(3)	Raw Waste Load	I	$K^{(1)}$
	Flow, gal/ton	3900	750	750
	Suspended Solids	100	30	15
	Oil and Grease	25	5	5
	Hexavalent Chromium	0.5	0.02	0.02
	Dissolved Iron	40	0.2	0.2
	pH (Units)	3-9	6-9	6-9
115	Arsenic	0.1	0.1	0.1
119	Chromium	1.0	0.1	0.1
120	Copper	0.4	0.1	0.1
122	Lead	1.0	0.1	0.1
124	Nickel	0.2	0.2	0.1
128	Zinc	20	0.1	0.1

TABLE VIII-17
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory:	Hot Coating-Galvanizing	Model Size-TPD :	100
:	Wire Products and Fasteners	Oper. Days/Year:	260
:	Without Scrubbers	Turns/Day :	3

C&TT Steps	Alternative #1 A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	Total	Alternative #2 $J^{(1)}$	$K^{(1)}$	Total
Investment $\$ \times 10^{-3}$	54	40	32	27	31	3	88	48	323	23	97	443
Annual Cost $\$ \times 10^{-3}$												
Capital	2.3	1.7	1.4	1.2	1.3	0.1	3.8	2.1	13.9	1.0	4.2	19.1
Depreciation	5.4	4.0	3.2	2.7	3.1	0.3	8.8	4.8	32.3	2.3	9.7	44.3
Operation and Maintenance	1.9	1.4	1.1	0.9	1.1	0.1	3.1	1.7	11.3	0.8	3.4	15.5
Sludge Disposal	-	-	-	-	-	-	-	1.8	1.8	-	-	1.8
Energy and Power(2)	-	0.3	0.2	0.1	0.1	0.1	0.2	0.3	1.3	0.1	0.2	1.6
Chemical Costs	-	-	0.3	0.5	0.5	-	-	-	1.3	0.3	-	1.6
Oil Disposal	-	-	-	-	-	0.1	-	-	0.1	-	-	0.1
Expendable Parts	7.1	-	-	-	-	-	-	-	7.1	-	-	7.1
TOTAL	16.7	7.4	6.2	5.4	6.1	0.7	15.9	10.7	69.1	4.5	17.5	91.1

Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	2400	600	600
Suspended Solids	150	30	15
Oil and Grease	40	5	5
Hexavalent Chromium	1.0	0.02	0.02
Dissolved Iron	75	0.2	0.2
pH (Units)	3-9	6-9	6-9
115 Arsenic	0.2	0.1	0.1
119 Chromium	2.5	0.1	0.1
120 Copper	0.8	0.1	0.1
122 Lead	2.0	0.1	0.1
124 Nickel	0.5	0.2	0.1
128 Zinc	35	0.1	0.1

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(1) Components are used in tandem.
(2) Costs are all power.
(3) All values are in mg/l unless otherwise specified.
(4) Total cost does not include power as a credit is applied for existing process water needs.

KEY TO C&TT STEPS

A: Install cascade or counter-current rinse system.
B: Equalization
C: Adjust pH to 6-9 with lime
D: Chemical Reduction
E: Polymer Addition
F: Oil Skimming
G: Flocculator/Clarifier
H: Vacuum filtration of thickener underflow
I: Recycle fume hood scrubber waters, with 8-10% blowdown
J: Precipitation with sulfide
K: Filtration

TABLE VIII-18

PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory: Hot Coating-Terne
: Strip/Sheet
: With Scrubbers

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

C&TT Steps	Alternative #1										Alternative #2		
	A	B	C	D	E	F	G(1)	H(1)	I	Total	J(1)	K(1)	Total
Investment \$ x 10^{-3}	117	108	83	75	72	6	206	82	70	819	25	014	948
Annual Cost \$ x 10^{-3}													
Capital	5.0	4.6	3.6	3.2	3.1	0.3	8.9	3.5	3.0	35.2	1.1	4.5	40.8
Depreciation	11.7	10.8	8.3	7.5	7.2	0.6	20.6	8.2	7.0	81.9	2.5	10.4	94.8
Operation and Maintenance	4.1	3.8	2.9	2.6	2.5	0.2	7.2	2.9	2.5	28.7	0.9	3.6	33.2
Sludge Disposal	-	-	-	-	-	-	-	1.9	-(4)	1.9	-	-	1.9
Energy and Power(2)	-	1.5	0.6	0.6	0.5	0.1	0.6	0.6	0.9	4.5	0.1	0.3	4.9
Chemical Costs	-	-	1.1	-	2.2	-	-	-	-	3.3	0.3	-	3.6
Oil Disposal	-	-	-	-	-	0.1	-	-	-	0.1	-	-	0.1
Expendable Parts	15.5	-	-	-	-	-	-	-	-	15.5	-	-	15.5
TOTAL	36.3	20.7	16.5	13.9	15.5	1.3	37.3	17.1	12.5(4)	171.1	4.9	18.8	194.8

Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	1200	200	200
Suspended Solids	50	30	15
Oil and Grease	25	5	5
Hexavalent Chromium	0.02	0.02	0.02
Dissolved Iron	50	0.2	0.2
Tin	5	3	0.1
pH (Units)	3-9	6-9	6-9
115 Arsenic	0.1	0.1	0.1
118 Cadmium	0.1	0.1	0.1
119 Chromium	3	0.1	0.1
120 Copper	0.5	0.1	0.1
122 Lead	0.5	0.1	0.1
124 Nickel	0.8	0.2	0.1
128 Zinc	1.0	0.1	0.1

TABLE VIII-18
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Terne
: Strip/Sheet
: Without Scrubbers

Model Size-TPD : 365
Oper. Days/Year: 260
Turns/Day : 3

		Alternative #1									Alternative #2		
C&TT Steps		A	B	C	D	E	F	G$^{(1)}$	H$^{(1)}$	Total	J$^{(1)}$	K$^{(1)}$	Total
Investment $ x 10^{-3}		117	40	32	30	31	3	81	48	382	22	87	491
Annual Cost $ x 10^{-3}													
Capital		5.0	1.7	1.4	1.3	1.3	0.1	3.5	2.1	16.4	1.0	3.7	21.1
Depreciation		11.7	4.0	3.2	3.0	3.1	0.3	8.1	4.8	38.2	2.2	8.7	49.1
Operation and Maintenance		4.1	1.4	1.1	1.1	1.1	0.1	2.8	1.7	13.4	0.8	3.0	17.2
Sludge Disposal		-	-	-	-	-	-	-	1.2	1.2	-	-	1.2
Energy and Power$^{(2)}$		-	0.3	0.2	0.3	0.1	0.1	0.2	0.3	1.5	0.1	0.2	1.8
Chemical Costs		-	-	0.2	-	0.5	-	-	-	0.7	0.2	-	0.9
Oil Disposal		-	-	-	-	-	0.1	-	-	0.1	-	-	0.1
Expendable Parts		15.5	-	-	-	-	-	-	-	15.5	-	-	15.5
TOTAL		36.3	7.4	6.1	5.7	6.1	0.7	14.6	10.1	87.0	4.3	15.6	106.9
Effluent Quality$^{(3)}$	Raw Waste Load												
Flow, gal/ton	600									150			150
Suspended Solids	75									30			15
Oil and Grease	40									5			5
Hexavalent Chromium	0.04									0.02			0.02
Dissolved Iron	75									0.2			0.2
Tin	10									3			0.1
pH (Units)	3-9									6-9			6-9
115 Arsenic	0.1									0.1			0.1
118 Cadmium	0.1									0.1			0.1
119 Chromium	5									0.1			0.1
120 Copper	1.0									0.1			0.1
122 Lead	1.0									0.1			0.1
124 Nickel	2.0									0.2			0.1
128 Zinc	2.0									0.1			0.1

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(1) Components are used in tandem.
(2) Costs are all power.
(3) All values are in mg/l unless otherwise specified.
(4) Total cost does not include power as a credit is applied for existing process water needs.

KEY TO C&TT STEPS

A: Install cascade or counter-current rinse system.	F: Oil Skimming
B: Equalization	G: Flocculator/Clarifier
C: Adjust pH to 6-9 with lime	H: Vacuum filtration of thickener underflow
D: Aeration	I: Recycle fume hood scrubber waters, with 8-10% blowdown
E: Polymer Addition	J: Precipitation with sulfide
	K: Filtration

TABLE VIII-19

PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS

Subcategory:	Hot Coating-Other Metallic Coatings	Model Size-TPD :	500
:	Strip/Sheet/Misc. Products	Oper. Days/Year:	260
:	With Scrubbers	Turns/Day :	2

	Alternative #1										Alternative #2		
C&TT Steps	A	B	C	D	E	F	G$^{(1)}$	H$^{(1)}$	I	Total	J$^{(1)}$	K$^{(1)}$	Total
Investment \$ x 10^{-3}	141	168	107	124	93	8	299	136	78	1154	26	135	315
Annual Cost \$ x 10^{-3}													
Capital	6.1	7.2	4.6	5.3	4.0	0.3	12.9	5.8	3.4	49.6	1.1	5.8	56.5
Depreciation	14.1	16.8	10.7	12.4	9.3	0.8	29.9	13.6	7.8	115.4	2.6	13.5	131.5
Operation and Maintenance	4.9	5.9	3.7	4.3	3.3	0.3	10.5	4.8	2.7	40.4	0.9	4.7	46.0
Sludge Disposal	-	-	-	-	-	-	-	4.8	-	4.8	-	-	4.8
Energy and Power$^{(2)}$	-	2.0	0.8	1.0	0.6	0.2	0.5	0.9	1.2$^{(4)}$	6.0	0.1	0.3	6.4
Chemical Costs	-	-	1.5	-	3.0	-	-	-	-	4.5	0.4	-	4.9
Oil Disposal	-	-	-	-	-	0.5	-	-	-	0.5	-	-	0.5
Expendable Parts	18.7	-	-	-	-	-	-	-	-	18.7	-	-	18.7
TOTAL	43.8	31.9	21.3	23.0	20.2	2.1	53.8	29.9	13.9$^{(4)}$	239.9	5.1	24.3	269.3

Effluent Quality$^{(3)}$	Raw Waste Load		
Flow, gal/ton	1200	200	200
Suspended Solids	250	30	15
Oil and Grease	50	5	5
Hexavalent Chromium	0.02	0.02	0.02
Dissolved Iron	20	0.2	0.2
Tin	5	1.5	0.1
Aluminum	25	2.5	0.1
pH (Units)	5-9	6-9	6-9
115 Arsenic	0.1	0.1	0.1
118 Cadmium	2.0	0.1	0.1
119 Chromium	0.2	0.1	0.1
120 Copper	0.5	0.1	0.1
122 Lead	1.5	0.1	0.1
124 Nickel	0.5	0.2	0.1
128 Zinc	5	0.1	0.1

TABLE VIII-19
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 2

Subcategory: Hot Coating-Other Metallic Coating
: Strip/Sheet/Misc. Products
: Without Scrubbers

Model Size-TPD : 500
Oper. Days/Year: 260
Turns/Day : 2

C&TT Steps	Alternative #1 A	B	C	D	E	F	$G^{(1)}$	$H^{(1)}$	Total	Alternative #2 $J^{(1)}$	$K^{(1)}$	Total
Investment $ x 10^{-3}	141	62	42	44	41	3	119	76	528	25	117	670
Annual Cost $ x 10^{-3}												
Capital	6.1	2.7	1.8	1.9	1.7	0.1	5.1	3.3	22.7	1.1	5.0	28.8
Depreciation	14.1	6.2	4.2	4.4	4.1	0.3	11.9	7.6	52.8	2.5	11.7	67.0
Operation and Maintenance	4.9	2.2	1.5	1.5	1.4	0.1	4.2	2.7	18.5	0.9	4.1	23.5
Sludge Disposal	-	-	-	-	-	-	-	3.7	3.7	-	-	3.7
Energy and Power$^{(2)}$	-	0.4	0.2	0.2	0.2	0.1	0.2	0.4	1.7	0.1	0.3	2.1
Chemical Costs	-	-	0.3	-	0.6	-	-	-	0.9	0.3	-	1.2
Oil Disposal	-	-	-	-	-	0.3	-	-	0.3	-	-	0.3
Expendable Parts	18.7	-	-	-	-	-	-	-	18.7	-	-	18.7
TOTAL	43.8	11.5	8.0	8.0	8.0	0.9	21.4	17.7	119.3	4.9	21.1	145.3

Effluent Quality$^{(3)}$	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	600	150	150
Suspended Solids	400	30	15
Oil and Grease	60	5	5
Hexavalent Chromium	0.02	0.02	0.02
Dissolved Iron	30	0.2	0.2
Tin	8	1.5	0.1
Aluminum	30	2.5	0.1
pH (Units)	4-10	6-9	6-9
115 Arsenic	0.1	0.1	0.1
118 Cadmium	4.0	0.1	0.1
119 Chromium	0.2	0.1	0.1
120 Copper	1.0	0.1	0.1
122 Lead	2.5	0.1	0.1
124 Nickel	0.5	0.2	0.1
128 Zinc	8	0.1	0.1

TABLE VIII-19
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 3

Subcategory: Hot Coating-Other Metallic Coating
: Wire Products and Fasteners
: With Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

C&TT Steps	Alternative #1										Alternative #2		
	A	B	C	D	E	F	G(1)	H(1)	I	Total	J(1)	K(1)	Total
Investment $ x 10^{-3}	17	38	33	35	34	6	84	55	34	336	19	61	416
Annual Cost $ x 10^{-3}													
Capital	0.7	1.6	1.4	1.5	1.5	0.3	3.6	2.4	1.5	14.5	0.8	2.6	17.9
Depreciation	1.7	3.8	3.3	3.5	3.4	0.6	8.4	5.5	3.4	33.6	1.9	6.1	41.6
Operation and Maintenance	0.6	1.3	1.2	1.2	1.2	0.2	3.0	1.9	1.2	11.8	0.7	2.1	14.6
Sludge Disposal	-	-	-	-	-	-	-	0.3	-	0.3	-	-	0.3
Energy and Power(2)	-	0.3	0.2	0.3	0.2	0.1	0.2	0.2	0.1(4)	1.5	0.1	0.1	1.7
Chemical Costs	-	-	0.2	-	0.3	-	-	-	-	0.5	0.1	-	0.6
Oil Disposal	-	-	-	-	-	0.1	-	-	-	0.1	-	-	0.1
Expendable Parts	2.3	-	-	-	-	-	-	-	-	2.3	-	-	2.3
TOTAL	5.3	7.0	6.3	6.5	6.6	1.3	15.2	10.3	6.1(4)	64.6	3.6	10.9	79.1

Effluent Quality(3)	Raw Waste Load	Alternative #1 Total	Alternative #2 Total
Flow, gal/ton	3900	750	750
Suspended Solids	100	30	15
Oil and Grease	25	5	5
Hexavalent Chromium	0.02	0.02	0.02
Dissolved Iron	12	0.2	0.2
Tin	3	1.5	0.1
Aluminum	12	2.5	0.1
pH (Units)	5-9	6-9	6-9
115 Arsenic	0.1	0.1	0.1
118 Cadmium	1.0	0.1	0.1
119 Chromium	0.8	0.1	0.1
120 Copper	0.3	0.1	0.1
122 Lead	1.0	0.1	0.1
124 Nickel	0.3	0.2	0.1
128 Zinc	3	0.1	0.1

TABLE VIII-19
PSES MODEL COST DATA: BASIS 7/1/78 DOLLARS
PAGE 4

Subcategory: Hot Coating-Other Metallic Coating
: Wire Products and Fasteners
: Without Scrubbers

Model Size-TPD : 15
Oper. Days/Year: 260
Turns/Day : 2

		Alternative #1									Alternative #2		
C&TT Steps		A	B	C	D	E	F	G(1)	H(1)	Total	J(1)	K(1)	Total
Investment $ x 10^{-3}		17	18	16	18	17	3	42	34	165	19	57	241
Annual Cost $ x 10^{-3}													
Capital		0.7	0.8	0.7	0.8	0.7	0.1	1.8	1.5	7.1	0.8	2.5	10.4
Depreciation		1.7	1.8	1.6	1.8	1.7	0.3	4.2	3.4	16.5	1.9	5.7	24.1
Operation and Maintenance		0.6	0.6	0.6	0.6	0.6	0.1	1.5	1.2	5.8	0.7	2.0	8.5
Sludge Disposal		-	-	-	-	-	-	-	0.3	0.3	-	-	0.3
Energy and Power(2)		-	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.7	0.1	0.1	0.9
Chemical Costs		-	-	0.1	-	0.1	-	-	-	0.2	0.1	-	0.3
Oil Disposal		-	-	-	-	-	0.1	-	-	0.1	-	-	0.1
Expendable Parts		2.3	-	-	-	-	-	-	-	2.3	-	-	2.3
TOTAL		5.3	3.3	3.1	3.3	3.2	0.7	7.6	6.5	33.0	3.6	10.3	46.9
Effluent Quality(3)	Raw Waste Load												
Flow, gal/ton	2400									600			600
Suspended Solids	150									30			15
Oil and Grease	40									5			5
Hexavalent Chromium	0.03									0.02			0.02
Dissolved Iron	25									0.2			0.2
Tin	5									1.5			0.1
Aluminum	25									2.5			0.1
pH (Units)	5-9									6-9			6-9
115 Arsenic	0.1									0.1			0.1
118 Cadmium	2.0									0.1			0.1
119 Chromium	1.0									0.1			0.1
120 Copper	0.5									0.1			0.1
122 Lead	1.5									0.1			0.1
124 Nickel	0.5									0.2			0.1
128 Zinc	5									0.1			0.1

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(1) Components are used in tandem.
(2) Costs are all power.
(3) All values are in mg/l unless otherwise specified.
(4) Total cost does not include power as a credit is applied for existing process water needs.

KEY TO C&TT STEPS

A: Install cascade or counter-current rinse system.
B: Equalization
C: Adjust pH to 6-9 with lime
D: Aeration
E: Polymer Addition
F: Oil Skimming
G: Flocculator/Clarifier
H: Vacuum filtration of thickener underflow
I: Recycle fume hood scrubber waters, with 8-10% blowdown
J: Precipitation with sulfide
K: Filtration

TABLE VIII-20

BPT CAPITAL COST TABULATION

Subcategory: Hot Coating - Galvanizing
: Strip, Sheet, and Miscellaneous Products

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place as of 1/1/78

Plant Code	TPD	C&TT Step							In-Place	Required	Total
		A	B	C	D	E	F	G			
0060	1311	195	151	117	130	12	387	207	887	312	1199
0060B	1173	182	141	109	122	11	362	194	928	193	1121
0060R	184	60	46	36	40	4	119	64	0	369	369
0068	39	24	18	14	16	2	47	25	0	146	146
0112A	1437	103-103	159	124	138	13	409	219	822	446	1268
0112B	1077	273	184	147	151	13	496	215	693	786	1479
0256D	1026	265	179	143	146	13	479	209	1013	421	1434
0256G	472	106	82	63	71	5	210	112	0	649	649
0264A	56	46	31	25	26	2	84	37	130	121	251
0384A	2235	269	207	161	180	17	533	285	286	1366	1652
0432A	177	92	62	50	51	4	167	73	357	142	499
0432B	540	115	88	69	77	7	227	122	0	705	705
0432D	1038	170	131	102	113	11	337	180	468	576	1044
0448A	637	126	98	76	85	8	251	134	98	680	778
0476A	180	59	46	36	40	4	118	63	290	76	366
0492A	186	95	64	51	53	5	172	75	100	415	515
0584C	1398	319	215	172	176	15	577	252	721	1005	1726
0584E	1278	302	204	163	167	15	547	238	1231	405	1636
0584F	1419	205	158	123	137	13	406	217	218	1041	1259
0684A	213	66	51	39	44	4	130	70	0	404	404
0684B	462	164	111	88	91	8	297	129	172	716	888
0684I	513	111	86	67	74	7	221	118	118	566	684
0728	75	35	-	-	-	2	-	-	37	0	37
0856D(1)	432	100	77	60	67	6	199	106	0	615	615
0856F	1020	264	178	142	146	13	478	208	1221	208	1429
0860D	1770	234	180	140	156	14	464	248	570	866	1436
0846B	1623	286	203	160	171	15	535	255	1210	415	1625
0868A	1551	277	198	156	165	15	521	248	1580	0	1580
0920D	345	138	93	74	76	7	249	109	145	601	746
0920E	2067	403	272	217	223	19	730	318	1965	217	2182
0948A	189	61	47	37	41	4	61-60	65	214	162	376
0948C	1296	194	150	116	130	12	385	206	871	322	1193
									16,345*	14,946*	31,291*

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*: Totals do not include confidential plants or dry operations.

NOTE: Underlined costs represent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the nonunderlined portion remains to be installed.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Chemical Reduction
D: Polymer Addition

E: Oil Skimming
F: Clarifier
G: Vacuum Filter

TABLE VIII-21

IPT CAPITAL COST TABULATION

Subcategory: Hot Coating - Galvanizing
: Wire, Wire Products, Fasteners

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place as of 1/1/78

Plant Code	TPD	C&TT Step A	B	C	D	E	F	G	In-Place	Required	Total
0068	203	141	113	95	110	12	309	170	0	950	950
0112A	126	53-53	85	71	83	9	232	128	462	252	714
0112F	31	66	49	40	46	4	128	71	49	355	404
0112G	12	37	28	23	25	2	72	40	28	199	227
0112H	3.5	12	10	8	10	1	27	15	60	23	83
0112I	88	85	69	57	67	7	187	103	518	57	575
0264	127	154	114	93	104	9	298	165	412	525	937
0264D	119	124	91	80	90	9	255	141	346	444	790
0460A	481	240	203	169	195	20	554	303	1201	492	1693
0460C	56	94	70	57	64	6	182	101	0	574	574
0460D	90	86	69	58	68	8	190	104	431	152	583
0460E	54	63	51	43	50	6	140	77	318	112	430
0460F	10	23	18	16	18	2	51	28	18	138	156
0460G	30	45	36	30	35	4	98	54	179	123	302
0460H	11	24	20	16	19	2	54	29	0	164	164
0476A	28	62	46	38	42	4	120	67	341	38	379
0580A	8	20	16	14	16	2	44	24	40	96	136
0580G	5	15	12	10	12	1	33	18	0	101	101
0612	284	172	138	116	135	15	378	208	807	355	1162
0640	181	131	106	89	103	11	288	158	563	323	886
0640B	15	29	26	20	23	3	65	36	112	88	200
0856P	17	46	34	28	31	3	66-23	49	23	257	280
0860F	144	114	92	77	90	10	251	138	467	305	772
0860G	112	98	-	-	-	-	-	-	98	0	98
0864B	108	105	82	69	80	8	226	122	501	191	692
0868A	57	66	53	44	51	6	144	79	66	377	443
0936	8	20	16	14	16	2	22-22	24	58	78	136
									7098*	6769*	13,867*

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*: Totals do not include confidential plants or dry operations.

NOTE: Underlined costs repesent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the nonunderlined portion remains to be installed.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Chemical Reduction
D: Polymer Addition
E: Oil Skimming
F: Clarifier
G: Vacuum Filter

TABLE VIII-22

BPT CAPITAL COST TABULATION

Subcategory: Hot Coating
: Terne

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place as of 1/1/78

Plant Code	TPD	C&TT Step A	B	C	D	E	F	G	In-Place	Required	Total
0060	522	144	114	105	104	10	285	136	754	144	898
0648	18	15	12	11	12	2	31	18	0	101	101
0684B	225	107	82	75	71	6	51-153	81	138	488	626
0856D[1]	561	185	142	129	123	10	353	141	185	898	1083
0920F	153	54	44	41	43	5	111	66	59	305	364
									1136	1936	3072

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(1) Treatment plant under construction in 1978. Expected completion in 1979.

NOTE: Underlined costs repesent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the nonunderlined portion remains to be installed.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Aeration
D: Polymer Addition

E: Oil Skimming
F: Clarifier
G: Vacuum Filter

TABLE VIII-23

BPT CAPITAL COST TABULATION

Subcategory: Hot Coating - Other Metals
: Strip, Sheet

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place as of 1/1/78

Plant		C&TT Step									
Code	TPD	A	B	C	D	E	F	G	In-Place	Required	Total
0112A	375	119	82	85	79	7	230	147	749	0	749
0384A	625	81-81	111	115	107	9	312	200	90	926	1016
0856D	516	145	99	103	96	8	278	178	481	426	907
									1320	1352	2672

NOTE: Underlined costs represent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the nonunderlined portion remains to be installed.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Aeration
D: Polymer Addition
E: Oil Skimming
F: Clarifier
G: Vacuum Filter

TABLE VIII-24

BPT CAPITAL COST TABULATION

Subcategory: Hot Coating - Other Metals
: Wire, Wire Products, and Fasteners

Basis: 7/1/78 Dollars x 10^{-3}
: Facilities in Place as of 1/1/78

Plant Code	TPD	C&TT Step A	C&TT Step B	C&TT Step C	C&TT Step D	C&TT Step E	C&TT Step F	C&TT Step G	In-Place	Required	Total
0112C	26	29	26	29	28	6	70	57	154	91	245
0112I	3.6	17	15	17	17	3	41	34	90	54	144
0460H	17	44	39	44	42	9	105	85	0	368	368
0580G	7.5	27	24	27	26	5	64	52	0	225	225
0684B	3	16	14	16	15	3	37	30	82	49	131
0792A	0.8	7	6	7	7	1	17	14	0	59	59
0860F	45	106	93	98	95	15	236	155	703	95	798
									1029*	941*	1970*

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*: Totals do not include confidential plants or dry operations.

NOTE: Underlined costs repesent facilities in place. Where two figures appear in the same column, the underlined portion is in place; the nonunderlined portion remains to be installed.

KEY TO C&TT STEPS

A: Equalization
B: Adjust pH to 6-9 with lime
C: Aeration
D: Polymer Addition
E: Oil Skimming
F: Clarifier
G: Vacuum Filter

TABLE VIII-25

BPT COST REQUIREMENTS
HOT COATING SUBCATEGORY

(All costs in millions of 7/1/78 dollars)

	Capital Investment Costs			Annual Costs		
	In Place	Required	Total Capital	Current(1)	Additional(2)	Total Annual(3)
Galvanizing						
Strip, Sheet, Miscellaneous	16.85	18.31	35.16	3.47	3.77	7.24
Wire Products and Fasteners	7.02	13.24	20.26	1.37	2.59	3.96
Subtotal - Galvanizing	23.87	31.55	55.42	4.84	6.36	11.20
Terne Coating						
Strip, Sheet Only	1.16	2.58	3.74	0.22	0.50	0.72
Other Metals						
Strip, Sheet, Miscellaneous	1.36	1.31	2.67	0.26	0.25	0.51
Wire Products and Fasteners	1.74	0.37	2.11	0.31	0.07	0.38
Subtotal - Other Metals	3.10	1.68	4.78	0.57	0.32	0.89
Hot Coating Totals	28.13	35.81	63.94	5.63	7.18	12.81

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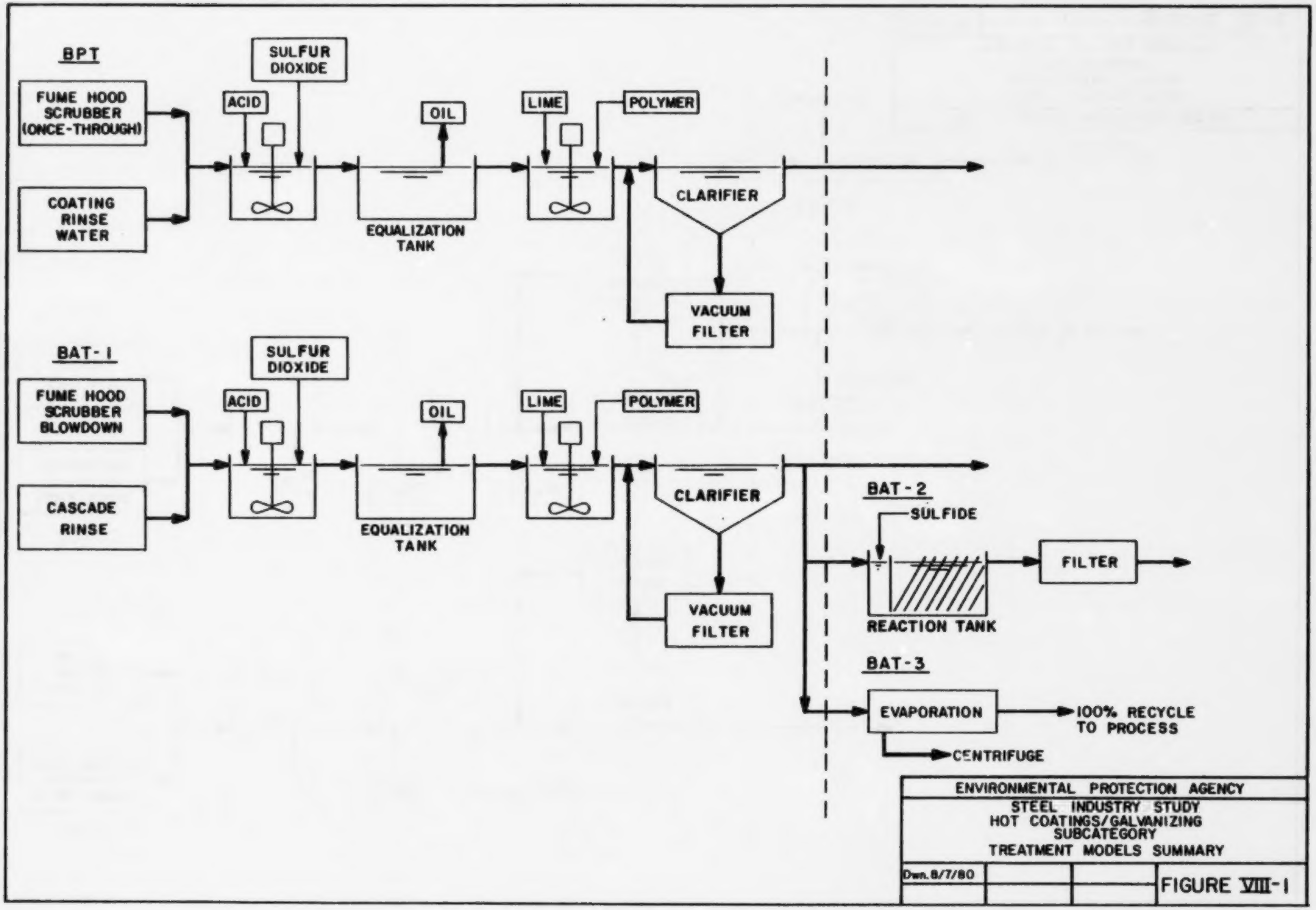
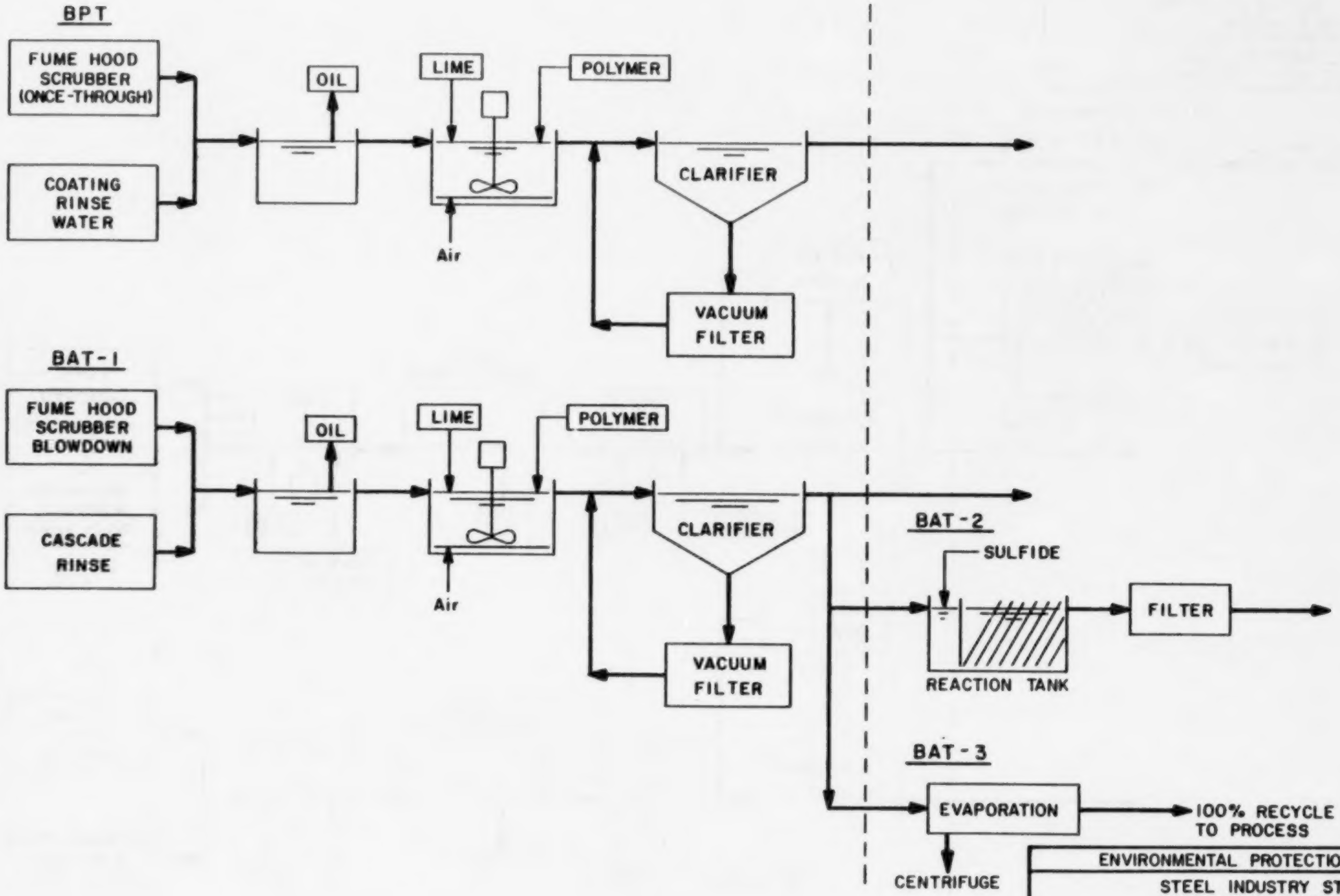
(1) Annual operating costs for BPT treatment components already in place.
(2) Annual operating costs for BPT treatment components yet to be installed to attain limits.
(3) Total projected annual costs to attain BPT limits.

NOTE: Costs are based on model plant costs on a stand-alone basis. Due to the prevalence of central treatment systems, actual capital investment still required is estimated to be 75% of the total amount shown, or nearly $27,000,000. Annual operating costs will also be correspondingly lower.



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS/GALVANIZING SUBCATEGORY
TREATMENT MODELS SUMMARY

FIGURE VIII-1

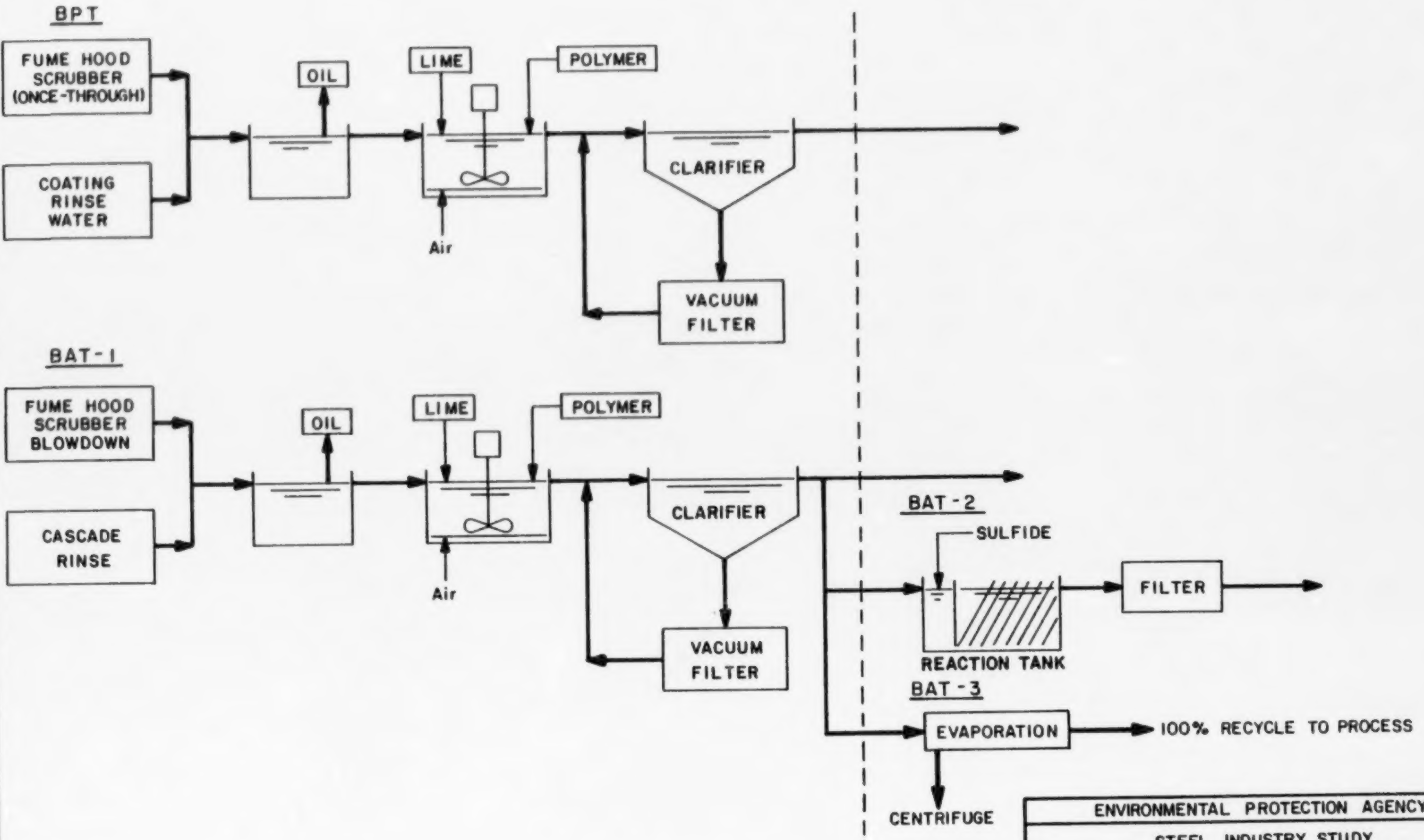


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/TERNE
SUBCATEGORY
TREATMENT MODELS SUMMARY

Dwn. 8/7/80

FIGURE VIII-2



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/OTHER METALS
SUBCATEGORY
TREATMENT MODELS SUMMARY

Dwn. 8/7/80

FIGURE VIII-3

HOT COATING SUBCATEGORY

SECTION IX

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST PRACTICABLE CONTROL TECHNOLOGY CURRENTLY AVAILABLE (BPT)

Identification of BPT

Based upon the information contained in Sections III through VIII, the Agency determined that effective pollutant load reductions for hot coating operations for the BPT level of treatment can be accomplished through the use of the following treatment systems:

A. Galvanizing Operations

This treatment system sequence includes: equalization of various wastewater sources; blending; chromium reduction by adding chemical reducing agents where necessary to control hexavalent chromium; lime neutralization with mixing in a reactor tank; polymer addition to enhance flocculation and sedimentation; automatic oil skimming; and provision for a thickener or clarifier with sufficient retention time to settle suspended solids. All wastewaters, including fume scrubber wastewaters, are treated once-through by this system.

The Agency has costed chromium reduction for the total wastewater flow from galvanizing operations. However, it is less expensive to treat only the chromate rinsewaters for hexavalent chromium.

B. Terne and Other Metal Coating Operations

All steps in the BPT model treatment system are the same as for galvanizing, except that a separate chromium reduction step is generally not required. Ferrous iron from pickling rinses normally provides sufficient reducing capability to accomplish the desired elimination of any hexavalent chromium which may be present. An aeration step is substituted for chromium reduction in the BPT model treatment system. As before, all process and fume scrubber wastewaters are treated once-through by this system.

The proposed BPT limitations are summarized in Tables IX-1 through IX-3. Figures IX-1 through IX-3 present the BPT model treatment system.

Rationale for Selection of BPT

The following discussion summarizes the factors evaluated by the Agency in selecting the proposed BPT limitations.

BPT Flows

In determining the proposed BPT limitations, the Agency did not rely upon all flow data. In some cases, DCP respondents made no effort to distinguish between process and noncontact cooling water, thus overstating process flow rates. At other times, maximum design flows were given, which when paired with "typical" production data, yielding artificially high gallons/ton figures. The flow rate eventually selected as the BPT model flow is the average of most of the reported flows, omitting only those which were far outside the flows of the general population. A summary of flows shows the following comparisons. Since BPT model flows are all once-through, only applied rates are used.

	Average Applied Flow Rates in GPT	No. of Plants Included in Average
Galvanizing		
Strip,Sheet,Misc. Products:		
Rinsewaters	607	29 of 31
Scrubbers	583	11 of 11
Wire Products & Fasteners:		
Rinsewaters	2409	26 of 27
Scrubbers	1459	10 of 12
Terne Coating		
Strip,Sheet,Misc. Products:		
Rinsewaters	522	5 of 6
Scrubbers	508	3 of 3
Other Metal Coatings		
Strip,Sheet,Misc. Products:		
Rinsewaters	366	3 of 4
Scrubbers	[1]	[1]
Wire Products & Fasteners:		
Rinsewaters	2053	13 of 14
Scrubbers	(11520)[2]	1 of 1

[1] All scrubbers are listed as "dry".
[2] Only one scrubber reported data, although its effluent, combined with the highest rinsewater flow, was reported as 640 GPT.

Since flow rates by product are similar regardless of applied coating, the BPT model flow was standardized at levels resembling galvanizing flows (since more data points exist there). Flows used are 600 GPT for strip, sheet, and miscellaneous product rinsewaters, and 600 GPT for strip, sheet and miscellaneous product scrubber wastewaters. For wire products and fasteners, the flows are 2400 GPT for rinses and 1500 GPT for scrubbers.

The ability of surveyed plants to achieve the proposed BPT limitations is summarized below.

Hot Coating - Galvanizing

The Agency is proposing BPT limitations for TSS, oil and grease, total zinc, total chromium, hexavalent chromium, and pH. Refer to Table VII-2 for data concerning effluent wasteloads for these pollutants.

Total Suspended Solids (TSS)

Of the nine plants surveyed (one visited twice), only one, Plant V-2, was not providing sufficient retention time in a settling basin to achieve effective suspended solids removal, and that plant discharges its wastewaters to a POTW. Effluent data for the other plants are as follows:

Plant	Product	Scrubbers	TSS Load kg/kkg	Percent of Proposed BPT Limitation
I-2	Wire	Yes	0.0358	4.4
MM-2	Sheet	Yes[1]	0.175	93.3
NN-2[2]	Sheet	Yes	0.0308	12.3
111	Wire	No	0.0649	13.0
112	Strip	No	0.0514	41.1
114	Strip	No	0.0053	4.2
116	Fasteners	No	0.0027	0.5
118[2]	Sheet	Yes	0.181	72.4
119	Pipe	No	0.0025	2.0

[1] Plant has scrubber on one line, but not on the other. BPT allowance calculated on a 0.1875 kg/kkg basis.
[2] Revisited Plant.

All eight plants (NN-2 and 118 are the same plant) achieved the proposed BPT limitations, six by comfortable margins. Only final effluents were used in this evaluation. All data support the proposed BPT limitations for TSS.

Oil and Grease

All plants provided for some degree of oil removal, and most were successful. Some plants accomplished this by skimming, others by flocculation and settling.

Plant	Product	Scrubber	Effluent O&G Load kg/kkg	Percent of Proposed BPT Limitations
I-2	Wire	Yes	0.0128	5.2
V-2	Wire	No	0.0641	42.7
MM-2	Sheet	Yes[1]	0.0655	116.3
NN-2	Sheet	Yes	0.0498	66.4
111	Wire	No	0.0236	15.7
112	Strip	No	0.0072	19.2
114	Strip	No	0.0053	14.1
116	Fasteners	No	0.0099	6.6
118	Sheet	Yes	0.0245	32.7
119	Pipe	No	0.0067	17.9

[1] Plant has scrubber on one line, but not on the other. BPT allowance calculated on a 0.0563 kg/kkg basis.

The only discharger failing to achieve the proposed BPT limitations for oil and grease was Plant MM-2. An excessive contribution of 22.5 mg/l oil and grease was found in plant effluents. This effluent also contained cold rolling mill wastes. All other data support proposed BPT limts on oil and grease.

Zinc

Data exist for seven of the plants, indicating compliance with the proposed BPT limitations at all but one plant.

Plant	Product	Scrubber	Effluent Zinc Load kg/kkg	Percent of Proposed BPT Limitation
MM-2	Sheet	Yes[1]	0.000117	0.6
NN-2	Sheet	Yes	0.00776	31.0
111	Wire	No	0.000707	1.4
112	Strip	No	0.000287	2.3
114	Strip	No	0.000062	0.5
116	Fasteners	No	0.000321	0.6
118	Sheet	Yes	0.0330	132
119	Pipe	No	0.000031	0.2

[1] Plant has scrubber on one line, but not on the other. BPT allowance calculated on a 0.01875 kg/kkg basis.

All plants shown achieve the proposed BPT limitations for zinc except for Plant 118 during the second visit to that site. That visit was marred by flood conditions in a sump feeding the treatment plant, so that solids separations (including zinc hydroxide precipitates) were less effective than normal. A better effluent quality from that plant was achieved during an earlier visit (Plant NN-2) when TSS removals were effective and zinc loads were less than a third of the 30-day average limit. The proposed BPT limitations for zinc are being attained by plants visited using separate or central treatment systems.

Total Chromium

Excellent chromium removals were achieved at all plants for which data are available. Chemical reduction and precipitation are effective in converting dissolved hexavalent chromium to suspended solids which could then be separated out even where no reductant is added other than ferrous iron already present. Data for seven plants are summarized below.

Plant	Product	Scrubber	Effluent Cr Load kg/kkg	Percent of Proposed BPT Limitation
MM-2	Sheet	Yes[1]	0.00251	22.3
NN-2	Sheet	Yes	0.000154	1.0
111	Wire	No	0.000236	2.4
112	Strip	No	0.000084	1.1
114	Strip	No	0.000018	0.2
116	Fasteners	No	0.000075	0.8
118	Sheet	Yes	0.00132	8.8
119	Pipe	No	0.000015	0.2

[1] Plant has scrubber on one line, but not on the other. BPT allowance calculated on a 0.01125 kg/kkg basis.

The above data show that proposed BPT limitations for total chromium are less stringent than might otherwise be justified. Five of the seven plants listed above are approaching proposed BAT limitations for total chromium.

Hexavalent Chromium

As in the case of total chromium removal, hexavalent chromium was also effectively controlled at most plants which were visited, down to low concentration levels. These data are summarized below:

Plant	Product	Scrubber	Effluent Hexavalent Cr Load kg/kkg	Percent of Proposed BPT Limitation
MM-2	Sheet	Yes[1]	0.000015	20.0
NN-2	Sheet	Yes	0.000062	62.0
111	Wire	No	0.000035	17.5
112	Strip	No	0.000006	12.0
114	Strip	No	0.000005	10.0
116	Fasteners	No	0.000007	3.5
118	Sheet	Yes	0.000378	378
119	Pipe	No	0.000005	10.0

[1] Plant has scrubber on one line, but not on the other. BPT allowance calculated on a 0.000075 kg/kkg basis.

The excessive amount reported by Plant 118 is related to the problem defined above in the discussion on zinc. Poor solids separation allows for a greater carryout of all precipitates, and increases the likelihood of some dissolved materials also being carried out on the surface of the solids. Again, this same plant was complying with the limitation when operating with better solids removals (see Plant NN-2). All other data support the proposed BPT limitations for hexavalent chromium.

pH

Of the plants visited, three were found to be operating outside the proposed pH limitations for at least part of the time, while the other six were achieving pH limits of 6.0 to 9.0 during the sampling runs. Plant V-2 is equipped with pH controls, but insufficient neutralizing agents were being added to elevate pH levels to near neutral prior to discharge to a large POTW. Plant MM-2 also has pH contol, but is apparently subject to wide fluctuations in pH because of the variety of wastewater jointly treated in a large central treatment facility. Plant 112 was usually within pH constraints, but overshot to pH 9.5 for approximately six hours during the sample runs. In any case, the proposed BPT pH limitations are demonstrated to be readily achievable through the application of proper control technology and monitoring equipment.

Hot Coating - Terne Metal

The Agency is proposing BPT limitations for five pollutants: TSS, oil and grease, lead, tin, and pH. Refer to Table VII-3 for data concerning effluent loads for these pollutants as found during field sampling at two continuous strip terne coating lines (note that one plant was visited twice). Neither plant was treating terne line wastewaters at the time of sampling in October, 1973 and March, 1977, but both were exercising close attention to maintenance of rolls and squeegees, and were controlling solution rinses with dragout recovery tanks to minimize carryover of strong wastewater. Where control technology would be necessary to attain prescribed limits, it should be readily transferred from the hot coating galvanizing subcategory. In fact, by 1977 both sampled plants were constructing treatment systems which will jointly treat wastewaters from hot coating - terne and from other forming, finishing and coating lines, including galvanizing. Plant 113 has already reduced wastewater flow rates significantly. Flows reported as 2,194 gallons/ton during the first sampling visit to the site were measured at 1,006 gallons/ton during the revisit two years later. Since other characteristics of the raw wastewaters were similar, this plant achieved a 50 percent reduction in effluent load due to flow reductions alone.

Total Suspended Solids (TSS)

Data from all three sampling surveys indicate that plants were achieving the proposed BPT limitations for TSS even though no treatment was installed. The hot coating operations generate little scale, and since no neutralization was being practiced, no metallic hydroxides were formed to increase TSS concentration.

Plant	Product	Scrubber	Effluent TSS Load kg/kkg	Percent of Proposed BPT Limitation
OO-2	Strip	No	0.103	82.4
PP-2	Strip	Yes	0.0823	32.9
113	Strip	Yes	0.0461	18.4

Plants were attaining the proposed BPT limitations for TSS even without treatment, but are expected to generate additional solids during treatment as the wastewaters are neutralized. However, well designed systems have not had any problems in controlling TSS in hot coating effluents. Refer to the galvanizing plant visit summary for details on effective TSS control.

Oil and Grease (O&G)

As in the case of TSS, all three sampling surveys showed oil and grease loads in untreated effluents in compliance with proposed BPT limitations. And in this case, no additional increases in oil and grease are anticipated, so the installation of treatment facilities can only improve an already acceptable level of oils. These examples illustrate how tight control of process operating conditions can greatly aid the pollutant load reduction goals of conscientious plant operators. Dollars spent on maintenance and control of line operations can save dollars from being spent on pollution control and treatment plants. Note the improvement at Plant 113 (formerly PP-2) brought about through flow reduction alone.

Plant	Product	Scrubber	Effluent O&G Load kg/kkg	Percent of Proposed BPT Limitation
OO-2	Strip	No	0.0215	57.3
PP-2	Strip	Yes	0.0393	52.4
113	Strip	Yes	0.0168	22.4

Lead

In all three cases the proposed BPT limitation for lead from terne coating lines were being met, again despite the absence of treatment.

Plant	Product	Scrubber	Effluent Pb Load kg/kkg	Percent of Proposed BPT Limitation
OO-02	Strip	No	0.000431	34.5
PP-2	Strip	Yes	<0.00046	<18.4
113	Strip	Yes	0.000293	11.7

Since total lead was analyzed, the eventual lead content in treated effluents is likely to be at least as low as the values shown above. As long as the industry continues to maintain process control at the current level, no problems with lead are anticipated. Hence, the proposed BPT limitations can be achieved.

Tin (Sn)

As with all other pollutants discussed thus far, the tin content of untreated effluents from the terne coating lines surveyed and sampled met the proposed BPT limitation.

Plant	Product	Scrubber	Effluent Tin Load kg/kkg	Percent of Proposed BPT Limitation
OO-2	Strip	No	<0.0043	<34.4
PP-2	Strip	Yes	<0.0183	<73.2
113	Strip	Yes	<0.000042	<0.2

Total tin content in treated effluents is expected to be at least as low as in the untreated effluents shown above. The proposed BPT limitations should be effectively met by all terne-coating lines.

pH

None of the plants surveyed were consistently achieving the desired pH levels of 6-9 in plant effluents, since acidic rinsewaters comprised the major portion of the untreated rinses leaving terne coating lines. The pH measurements made during the three visits typically showed values ranging between 2.2 and 5.2 units, with only an occasional rise to 6.5 during the revisit to Plant 113. However, the installation of treatment facilities at both locations included pH controls to consistently maintain the proper pH levels for discharge. Since the necessary technology has been demonstrated on a wide variety of wastewater, including the wastes from hot coating - galvanizing, no problems are anticipated for terne lines in achieving the proposed BPT pH limitations.

Hot Coating - Aluminizing

BPT limitations for hot coating operations for metals other than zinc and terne mixtures were not previously promulgated. BPT limitations covering other hot coating operations and controlling discharges of cadmium, lead, suspended solids, oil and grease, zinc, and pH are being proposed herein. All data shown below are for a single plant - Plant 116, a fastener aluminizing line. Effluent data showed the following at a discharge flow of 3960 gallons/ton. The BPT model flow is 2400 gallons/ton.

Pollutant	Conc. mg/l	Load in kg/kkg Effluent	Load in kg/kkg Prop. BPT	Percent of Proposed BPT Limitation
Chromium	<0.03	<0.0005	0.0050	<10.0
Cadmium	<0.01	<0.00017	0.0050	<3.4
Lead	<0.08	<0.00132	0.0050	<26.4
Zinc	0.13	0.00215	0.030	7.2
TSS	<1	<0.0165	0.500	<3.3
O&G	4	0.0661	0.150	44
pH	7.3-7.7	--	6-9	--

Plant 116 complies with all proposed BPT limitations for this subcategory.

The above limits are also applicable to hot coatings other than aluminum. The treatability of specific metallic pollutants is such that the proposed limitations are attainable using the BPT model treatment system.

TABLE IX-1

BPT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - GALVANIZING

BPT Effluent Limitations in kg/kkg (lbs/1000 lbs)[1]

	TSS	O&G	Chromium, Total	Chromium +6	Zinc	pH Units	Flow Basis GPT	Estimated Cost $/kkg	Estimated Cost $/ton
Strip, Sheet, Miscellaneous Products, Basic	0.125	0.0375	0.0075	0.00005	0.0125	6-9	600	0.97	0.88
Add for scrubbers	0.125	0.0375	0.0075	0.00005	0.0125	6-9	600	0.41	0.37
Wire Products and Fasteners, Basic	0.500	0.150	0.010	0.00020	0.050	6-9	2400	5.15	4.67
Add for scrubbers	0.313	0.094	0.0063	0.00013	0.0313	6-9	1500	1.71	1.55

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(1) 30-day average limitations. Daily maximum values are three times the limitation stated.

TABLE IX-2

BPT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - TERNE METAL

(BPT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	TSS	O&G	Lead	Tin	pH Units	Flow Basis GPT	Estimated Cost	
							$/kkg	$/ton
Strip, Sheet, Miscellaneous Products, Basic	0.125	0.0375	0.00125	0.0125	6-9	600	1.37	1.24
Add for scrubbers	0.125	0.0375	0.00125	0.0125	6-9	600	0.53	0.48

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(1) 30-day average limitations. Daily maximum values are three times the limitation stated.

TABLE IX-3

BPT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - OTHER METALS

BPT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	TSS	O&G	Chromium	Lead	Zinc	Cadmium(2)	pH Units	Flow Basis GPT	Estimated Cost	
									$/kkg	$/ton
Strip, Sheet, Miscellaneous Products, Basic	0.125	0.0375	0.00050	0.00125	0.0075	0.00125	6-9	600	1.46	1.32
Add for scrubbers	0.125	0.0375	0.00050	0.00125	0.0075	0.00125	6-9	600	0.61	0.55
Wire Products and Fasteners, Basic	0.500	0.150	0.00500	0.00500	0.0300	0.00500	6-9	2400	17.67	16.03
Add for scrubbers	0.313	0.0938	0.00313	0.00313	0.0188	0.00313	6-9	1500	3.81	3.46

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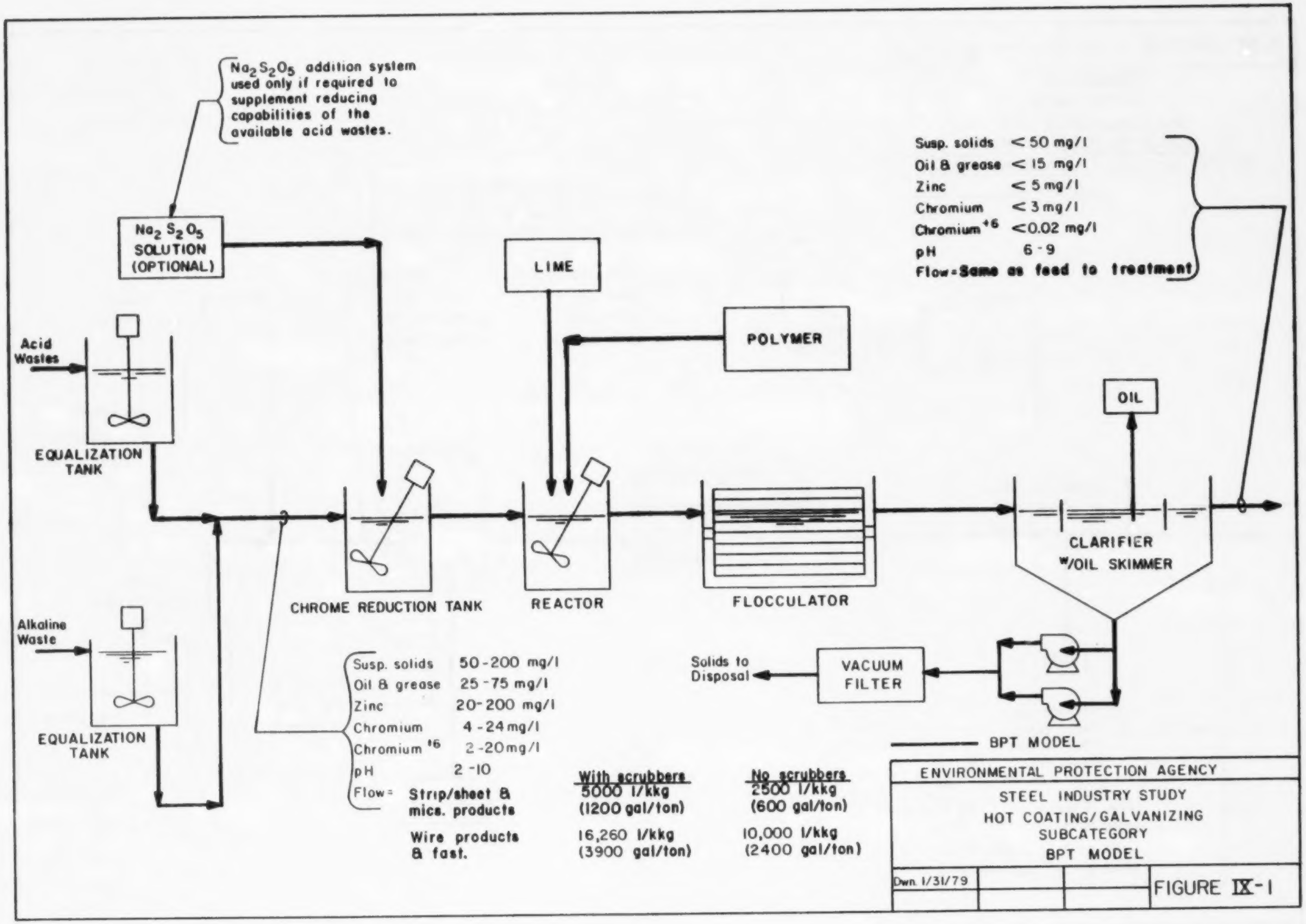
(1) 30-day average limitations. Daily maximum values are three times the limitation stated.
(2) Applies only to operations using cadmium as a coating metal.



Susp. solids < 50 mg/l
Oil & grease < 15 mg/l
Zinc < 5 mg/l
Chromium < 3 mg/l
Chromium^{+6} <0.02 mg/l
pH 6 - 9
Flow=Same as feed to treatment

Susp. solids 50-200 mg/l
Oil & grease 25-75 mg/l
Zinc 20-200 mg/l
Chromium 4-24 mg/l
Chromium^{+6} 2-20 mg/l
pH 2-10

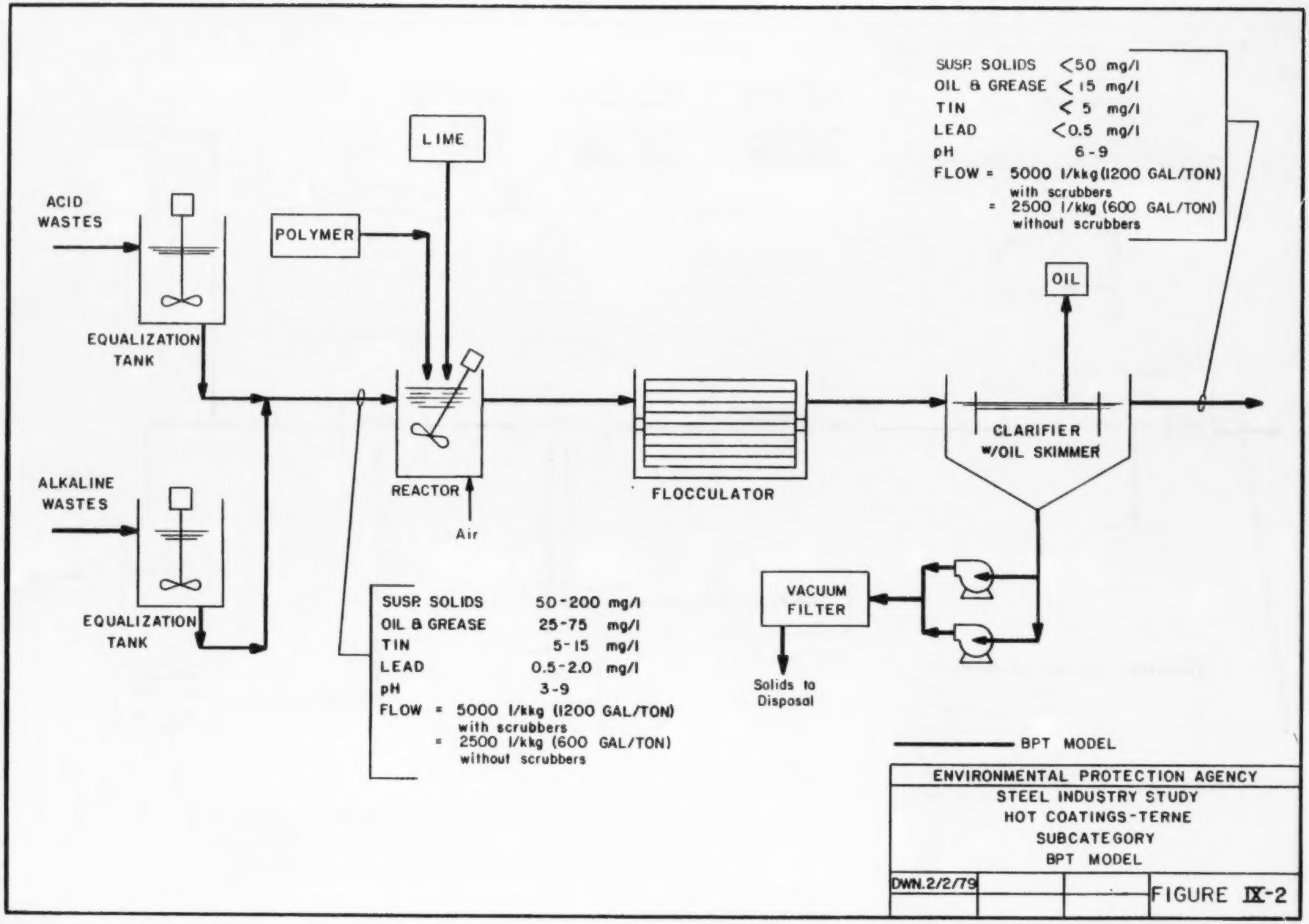
Flow=	With scrubbers	No scrubbers
Strip/sheet & mics. products	5000 l/kkg (1200 gal/ton)	2500 l/kkg (600 gal/ton)
Wire products & fast.	16,260 l/kkg (3900 gal/ton)	10,000 l/kkg (2400 gal/ton)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATING/GALVANIZING
SUBCATEGORY
BPT MODEL

Dwn. 1/31/79

FIGURE IX-1



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS-TERNE
SUBCATEGORY
BPT MODEL

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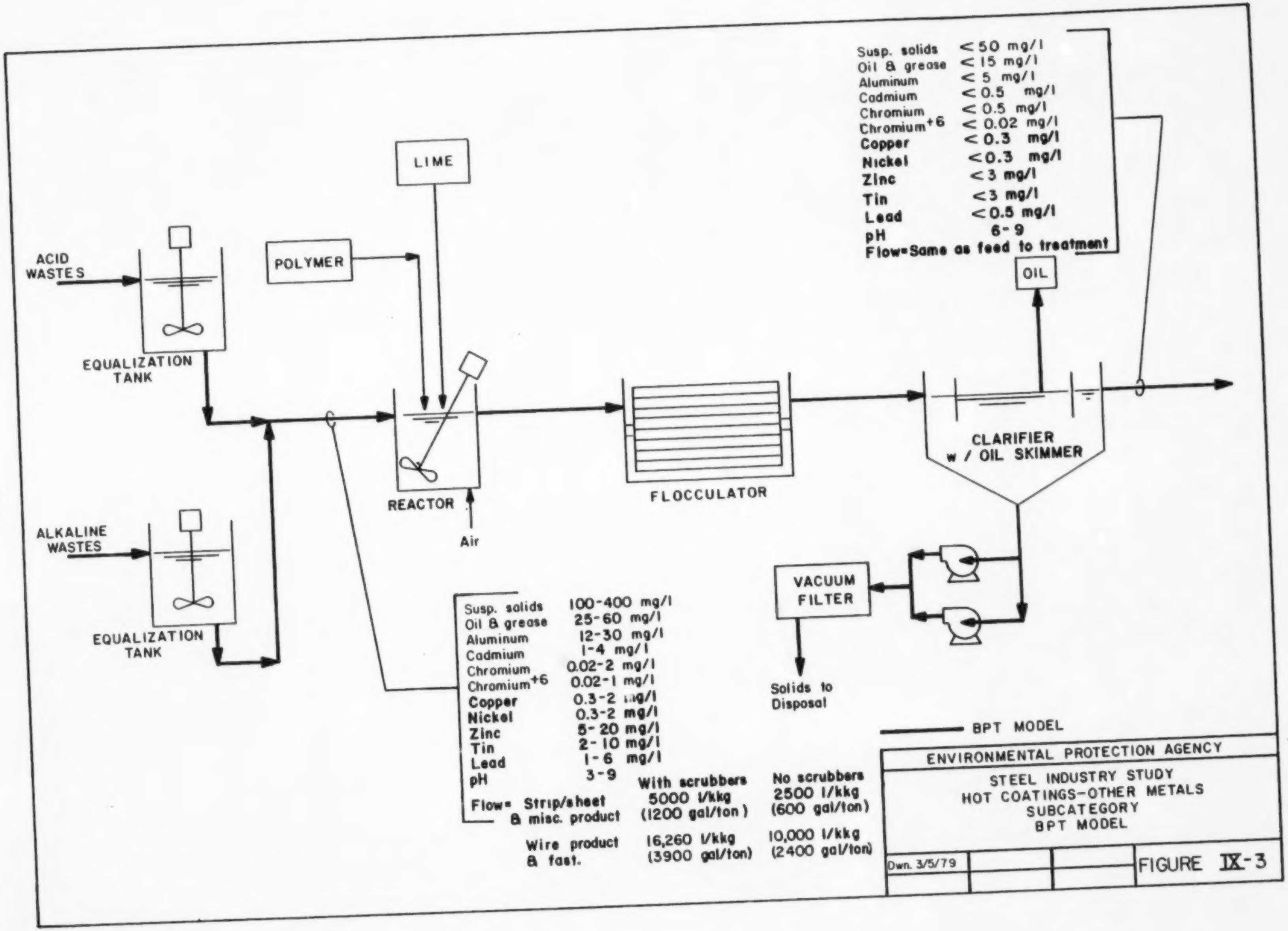
FIGURE IX-2



ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-OTHER METALS
SUBCATEGORY
BPT MODEL

Dwn. 3/5/79

FIGURE IX-3

HOT COATING SUBCATEGORY

SECTION X

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF THE BEST AVAILABLE TECHNOLOGY ECONOMICALLY ACHIEVABLE

Introduction

The Best Available Technology Economically Available (BAT) effluent limitations are to be attained by July 1, 1984. BAT is determined by reviewing subcategory practices and identifying the best economically achievable control and treatment technologies employed within the subcategory. In addition, a technology that is readily transferable from another subcategory or industry may be identified as BAT.

This section identifies the BAT alternative treatment systems considered for the hot coating subcategory. The rationale for selecting the BAT alternative treatment system is presented along with the proposed BAT limitations.

The BAT alternative treatment systems for hot coating operations are summarized in Tables VIII-4 through VIII-6. Tables VIII-10 through VIII-12 provide costs of the control and treatment technology applicable or normally employed to reach the pollutant levels indicated for each of three alternatives. Tables X-1 through X-3 present the limitations for each coating metal subdivision. Figures X-1 through X-9 present the BAT alternative treatment systems matching the appropriate tables. The effluent levels shown herein are not necessarily the lowest values attainable (except where no discharge of process wastewater pollutants to navigable waters is indicated) by the alternative treatment systems but rather they represent values which can be readily achieved on a regular basis.

It should be noted that these effluent loads represent values not to be exceeded by any monthly average. Reference is made to Appendix A of Volume I for the derivation of monthly average and daily maximum performance standards.

Identification of BAT

In selecting the BAT model treatment systems, the Agency considered the responses to the DCPs and D-DCPs, operating conditions observed at the plants surveyed, and industry comments.

As indicated previously in Section III and IX, significant differences exist among hot coating lines because of product requirements. However, mass loadings of the various limited pollutants can be reduced from the proposed BPT levels through the application of additional treatment. Flow rates from certain wastewater sources can be minimized by cascade or countercurrent rinsing and recycle or reuse.

Wastewater discharge flow rates are reduced prior to treatment as a first step toward control of toxic pollutants. Pickling, cleaning, and final product rinses are cascaded to minimize discharges. Where fume hood scrubbers exist, these wastewaters are recirculated either before blowdown to treatment or by recycling treated wastewater to the scrubber. DCP responses show that water flows at all types of galvanizing lines have been reduced by these methods. Well run scrubbers operate with 5-10% blowdown in controlling fumes from galvanizing. All terne coating line scrubbers were reported as once-through, although two out of three reported discharge flows are less than 130 gallons per ton. Scrubbers are rare on lines coating with other metals. The only wet scrubber flow rate reported by other metal coating lines is from a wire aluminizer who cites an applied flow rate of 11,520 GPT. Despite this enormous flow, the total combined discharge (rinses and scrubber blowdown) leaving that line is 640 GPT. For a summary of recycle data applicable to scrubbers, refer to Table X-4.

Several sheet and strip coating lines operate with rinsewater flows as low as 1 to 30 gallons per ton. However, these cases represent the lowest flow rates attained. The model BAT rinsewater flow is less restrictive. All three BAT alternative treatment systems include flow reduction so that rinsewaters will total 150 gallons/ton and fume hood scrubber blowdown is reduced to 50 gal/ton for strip/sheet and miscellaneous shapes. Wire, wire products and fastener coaters would reduce flows to 600 gallons/ton for rinses and 150 gallons/ton for fume hood scrubber blowdowns. Examples of those discharge levels are summarized in Table X-5.

Concentration levels which the alternative BAT treatment systems can attain are reviewed in Appendix A of Volume I. The technologies were summarized in Table VIII-4 through VIII-6 and are described below. The increase in operating costs in dollars per kkg ($/ton) of finished product over costs necessary to operate the BPT model treatment system is also indicated on the appropriate tables.

BAT Alternative No. 1

The first BAT alternative relies on flow reductions described above to increase retention times through the BPT treatment components. Effluent concentrations are lower than at BPT due to increased solids removal efficiency at the lower flow.

BAT Alternative No. 2

In Alternative 2, a sulfide precipitation step is added, followed by filtration to provide optimum solids separation. The sulfide precipitation technique has been used to treat similar wastewaters in the metal finishing industry, while the filtration step has been used in this subcategory. See Tables III-1 and III-3, Plants 0112B, 0112I, 0432D, 0460E, 0580A, 0584C, 0584E, 0612, 0684Y, 0856N, and 0860F, also plant visits to Plants 111 and 116.

BAT Alternative No. 3

The third alternative evaporates all wastewaters from the reduced flow effluent, recondensing it as potable grade water for recycle to the process or reuse elsewhere wherever high quality water is required.

Effluent Limitations

A review of analytical data shows that control over relatively few toxic metal pollutants provides adequate control over all other toxic metal pollutants in the wastewater. Therefore, the Agency is proposing BAT limitations for three toxic metals (chromium, lead, and zinc) for all hot coating operations, plus a fourth metal, cadmium, for lines coating with cadmium. Refer to Section XI for proposed effluent limitations for three conventional pollutants: TSS, oil and grease, and pH. The available long-term data on these conventional and toxic metal pollutants are summarized in Table X-6.

Selection of BAT Alternative

The Agency selected the BAT Alternative No. 1 as the BAT model treatment system upon which the proposed BAT limitations are based.

After reviewing the costs involved and the pollutant load reductions obtained, the third alternative was eliminated on the basis of high capital and annual operating cost (especially energy costs) in relation to the benefits achieved. The second alternative was not selected since Alternative 1 can provide for about the same control of toxic metals at less cost.

TABLE X-1

BAT Effluent Limitations Guidelines
Hot Coating - Galvanizing

BAT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium	Lead	Zinc	Flow Basis GPT	Estimated Cost(2) $/kkg	Estimated Cost(2) $/ton
A. Alternative 1*						
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150	0.31	0.28
Add to A1 for scrubbers	0.000021	0.000021	0.000021	50	0.07	0.07
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	600	0.71	0.64
Add to A2 for scrubbers	0.000063	0.000063	0.000063	150	0.41	0.37
B. Alternative 2						
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150	0.45	0.41
Add to B1 for scrubbers	0.000021	0.000021	0.000021	50	0.09	0.08
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	600	1.62	1.49
Add to B2 for scrubbers	0.000063	0.000063	0.000063	150	0.06	0.05
C. Alternative 3						
1. All Products, w/ or wo/scrubbers	No discharge of process wastewater pollutants to navigable streams.			0	2.86	2.59
					0.36	0.33
					16.90	15.33
					1.59	1.44

---

(1) 30-day average limitations. Daily maximum values are three times the limitations stated.
(2) Incremental additional cost over BPT.

*: Selected BAT alternative.

TABLE X-2

BAT Effluent Limitations Guidelines
Hot Coating - Terne Metal

BAT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium	Lead	Zinc	Flow Basis GPT	Estimated Cost(2) $/kkg	Estimated Cost(2) $/ton
A. Alternative 1*						
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150	0.55	0.50
2. For lines with scrubbers	0.000083	0.000083	0.000083	200	0.74	0.67
B. Alternative 2						
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150	0.85	0.77
2. For lines with scrubbers	0.000083	0.000083	0.000083	200	1.09	0.99
C. Alternative 3						
1. All products, w/ or wo/scrubbers	No discharge of process wastewater pollutants to navigable streams			0	6.14 6.88	5.57 6.24

---

(1) 30-day average limitations. Daily maximum values are three times the limitations stated.
(2) Incremental additional cost over BPT.

*: Selected BAT alternative.

TABLE X-3

BAT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - OTHER METALLIC COATINGS

BAT Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium	Lead	Zinc	Cadmium(2)	Flow Basis GPT	Estimated Cost(3) $/kkg	Estimated Cost(3) $/ton
A. Alternative 1*							
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	0.000063	150	0.37	0.34
Add to A1 for scrubbers	0.000021	0.000021	0.000021	0.000021	50	0.12	0.11
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	0.000250	600	1.50	1.36
Add to A2 for scrubbers	0.000063	0.000063	0.000063	0.000063	150	1.72	1.56
B. Alternative 2							
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	0.000063	150	0.60	0.54
Add to B1 for scrubbers	0.000021	0.000021	0.000021	0.000021	50	0.14	0.13
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	0.000250	600	5.40	4.90
Add to B2 for scrubbers	0.000063	0.000063	0.000063	0.000063	150	1.92	1.74
C. Alternative 3							
1. All products, w/ or wo/scrubbers	No discharge of process wastewater pollutants to navigable streams.				0	4.18 0.50 69.53 7.16	3.79 0.45 63.15 6.49

---

(1) 30-day average limitations. Daily maximum values are three times the limitations stated.
(2) Limits on cadmium only apply to operations which use cadmium as a coating metal.
(3) Incremental additional cost over BPT.

*: Selected BAT alternative.

TABLE X-4

JUSTIFICATION OF BAT FLOW BASIS
HOT COATING SUBCATEGORY
FUME HOOD SCRUBBER RECYCLE SYSTEMS

					Plant Data Demonstrates:	
Plant	Product	Applied GPT	Discharged GPT	Percent Recycle	GPT	Percent Reduction
BAT Basis	SSM	600	50	91.7	-	-
	WPF	1,500	150	90.0	-	-
0060G-1	WPF	*	*	90.9		X
0060G-2	WPF	*	*	90.9		X
0060G-3	WPF	*	*	90.9		X
0060G-4	WPF	*	*	90.9		X
0060G-5	WPF	*	*	91.1		X
0060S-1	WPF	*	*	95.0		X
0060S-2	WPF	*	*	95.0		X
0060S-3	WPF	*	*	91.1		X
0112F-1	WPF	2,152	143	93.4	X	X
0112F-2	WPF	4,000	267	93.3		X
0112F-All	WPF	2,796	186	93.3		X
0460C	WPF	806	0	100.0	X	X
0492A	SSM	387	0	100.0	X	X
0584C-1	SSM	1,319	158	88.0		
0684B	SSM	312	0	100.0	X	X
0856F-2	SSM	7,784	0	100.0	X	X
0856P	WPF	14,520	0	100.0	X	X
0864B-3	WPF	2,028	0	100.0	X	X
0864B-5	SSM	8.3	8.3	0.0	X	
0864B-All	Both	57	8.1	85.8	X	
0868A-3	SSM	15.3	15.3	0.0	X	
0920D-1	SSM	640	0	100.0	X	X
0920D-2	SSM	1,620	0	100.0	X	X
0920D-All	SSM	981	0	100.0	X	X
0860F-4	WPF-AL	11,520	0	100.0	X	X

---

* : Plants requested confidential treatment of production-related data.
X : Data supports stated BAT blowdown flow basis or recycle rate as indicated.

SSM: Strip, sheet and miscellaneous products.
WPF: Wire products and fasteners.
WPF-AL: Aluminizing line coating wire. All others are galvanizing lines.

TABLE X-5

JUSTIFICATION OF BAT FLOW BASIS
HOT COATING SUBCATEGORY
RINSEWATER FLOW REDUCTION SYSTEMS

					Plant Data Demonstrates:	
Plant	Product	Applied GPT	Discharged GPT	Percent Reduction	GPT	Percent Reduction
BAT Basis:	SSM	600	150	75.0	-	-
	WPF	2,400	600	75.0	-	-
0112B	SSM	101	101	0.0	X	
0112F	WPF	627	533	15.0	X	
0256G-1	SSM	107	107	0.0	X	
0256G-2	SSM	107	107	0.0	X	
0264-1	WPF	1,580	596	62.3	X	
0264-2	WPF	1,210	605	50.0		
0264-3	WPF	451	4.5	99.0	X	X
0264-All	WPF	991	345	65.0	X	
0264D-2	WPF	2,641	574	78.3	X	X
0384A-1	SSM	31.6	31.6	0.0	X	
0384A-2	SSM	21.9	21.9	0.0	X	
0384A-3	SSM	16.8	16.8	0.0	X	
0384A-4	SSM	168	168	0.0		
0384A-All	SSM	78.0	78.0	0.0	X	
0432B	SSM	2.2	2.2	0.0	X	
0448A	SSM	0.95	0.95	0.0	X	
0460C	WPF	1,080	5.4	99.5	X	X
0460F-1	WPF	706	141	80.0	X	X
0460F-2	WPF	627	125	80.0	X	X
0460F-All	WPF	641	127	80.0	X	X
0460H-1	WPF	507	507	0.0	X	
0460H-2	WPF	507	507	0.0	X	
0476A-3	SSM	56	56	0.0	X	
0612-1	WPF	1,510	196	87.0	X	X
0612-2	WPF	1,510	196	87.0	X	X
0612-3	WPF	1,510	196	87.0	X	X
0612-4	WPF	1,510	196	87.0	X	X
0640-1	WPF	529	529	0.0	X	
0728	SSM	480	0	100.0	X	X
0856N-1	SSM	112	0	100.	X	X
0856N-2	SSM	214	0	100.0	X	X
0856N-3	SSM	218	0	100.0	X	X
0856N-All	SSM	165	0	100.0	X	X

TABLE X-5
JUSTIFICATION OF BAT FLOW BASIS
HOT COATING SUBCATEGORY
RINSEWATER FLOW REDUCTION SYSTEMS
PAGE 2

Plant	Product	Applied GPT	Discharged GPT	Percent Reduction	Plant Data Demonstrates: GPT	Plant Data Demonstrates: Percent Reduction
0860F-1	WPF	3,130	157	95.0	X	X
0860F-2	WPF	5,760	9.6	99.8	X	X
0860F-3	WPF	5,760	6.4	99.9	X	X
0860F-All	WPF	4,500	79.4	98.2	X	X
0860G-1	WPF	8,182	0	100.0	X	X
0860G-2	WPF	3,025	0	100.0	X	X
0868A-1	SSM	182	182	0.0		
0868A-2	SSM	135	135	0.0	X	
0868A-3	SSM	169	169	0.0		
0868A-All	SSM	163	163	0.0		
0916A-3	SSM	120	0	100.0	X	X
0920D-1	SSM	640	64	90.0	X	X
0920D-2	SSM	120	120	0.0	X	
0920D-All	SSM	459	83.5	81.8	X	X
0920E-1	SSM	116	116	0.0	X	
0920E-2	SSM	136	136	0.0	X	
0920E-3	SSM	164	164	0.0		
0920E-All	SSM	132	132	0.0	X	
0948A	SSM	7.6	7.6	0.0	X	
0948C-1	SSM	140	140	0.0	X	
0948C-2	SSM	92	92	0.0	X	
0948C-All	SSM	111	111	0.0	X	
0920F (Terne)	SSM	301	141	53.2	X	
0384A(Al)	SSM	16	16	0.0	X	
0580G-3(Sn)	WPF	300	300	0.0	X	
0792B(Sn)	SSM	80	0	100.0	X	X
0860F-4(Al)	WPF	10,800	640(1)	94.1	X(1)	X

---

(1) Flow included scrubber blowdown. Demonstrates combined discharge flow basis of 750 GPT.

X : Data supports stated BAT discharge flow basis or percent reduction as indicated.
SSM: Strip, sheet and miscellaneous products.
WPF: Wire products and fasteners.
( ): Coating metal shown within parentheses. All others are galvanizing lines.

TABLE X-6

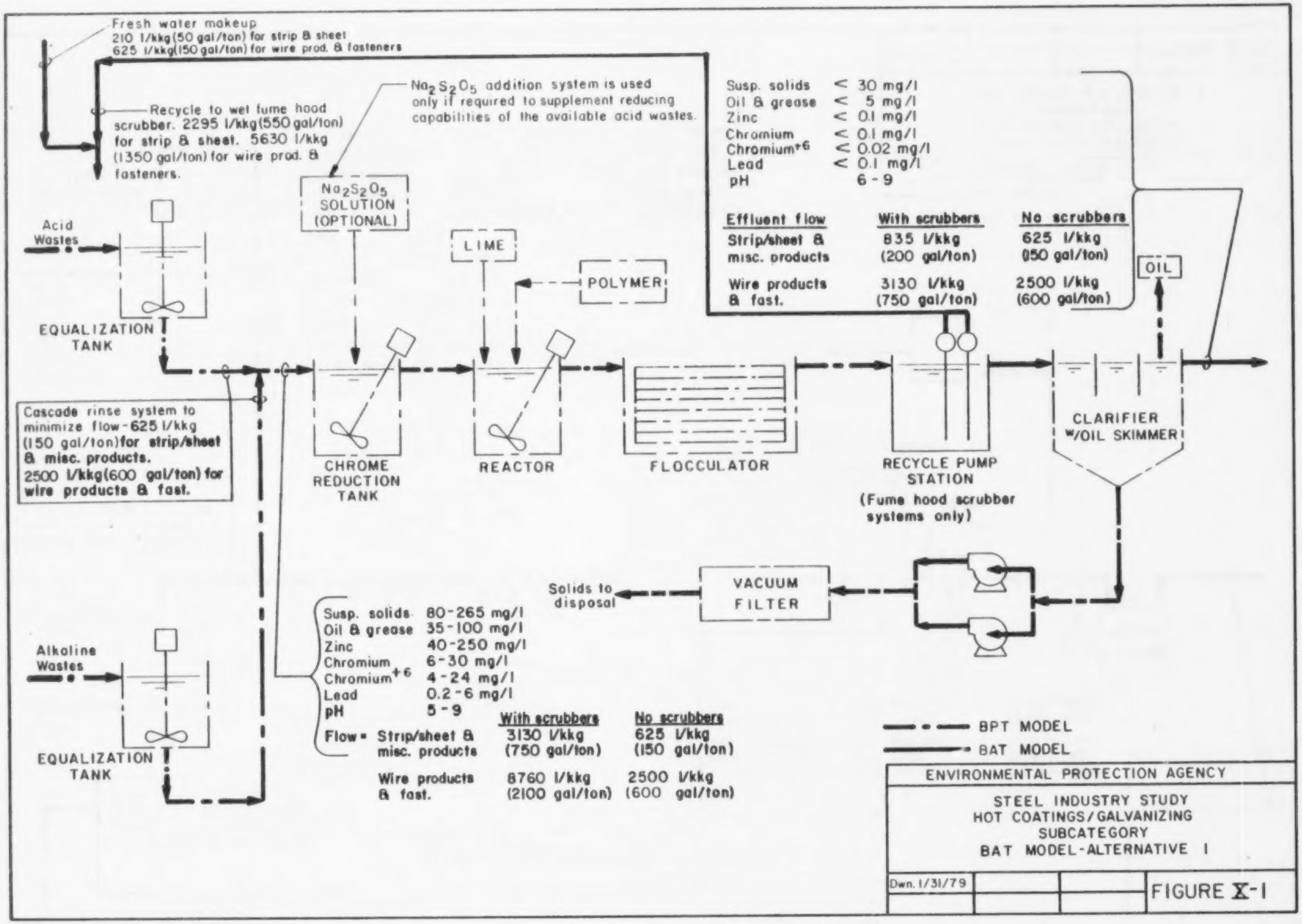
LONG-TERM DATA EVALUATION
HOT COATING - GALVANIZING

	Present Effluent Loads in kg/kkg(1)									
	TSS(2)		O&G(3)		Chromium		Lead		Zinc	
	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.	Avg.	Max.
Plant 0612*										
Wire Mill, no scrubbers:										
Applicable BAT limitations	0.0375	0.100	-	0.0250	0.00025	0.00075	0.00025	0.00075	0.00025	0.00075
Plant Data - 96 Samples	0.00245	0.0123	0.000327	0.00354	NA	NA	0.000016	0.000074	0.000172	0.000687
Percent of BAT Limitations	6.5	12.3	-	14.2	-	-	6.4	9.9	68.8	91.6
Plant 0868A										
Sheet Mill, 60% with scrubbers, 40% no scrubbers										
Applicable BAT limitations	0.0113	0.0303	-	0.00751	0.000075	0.000225	0.000075	0.000225	0.000075	0.000225
Plant Data - 148 samples	0.0216	0.846	0.00360	0.0258	<0.000031	0.000360	NA	NA	NA	NA
Percent of BAT limits	191	2792	-	344	<41.3	160	-	-	-	-
Plant Data - omit each maximum(4)	0.0160	-	0.00345	-	<0.000028	-	NA	NA	NA	NA
Percent of BAT limits	142	-	-	-	<37.3	-	-	-	-	-
Plant 0580A										
Wire Cloth Mills, no scrubbers										
Applicable BAT limitations	0.0375	0.100	-	0.0250	0.00025	0.00075	0.00025	0.00075	0.00025	0.00075
Plant Data - 101 samples	0.0392	0.701	NA	NA	NA	NA	NA	NA	0.0219	0.701
Percent of BAT limits	104	701	-	-	-	-	-	-	8760	93,467
Plant Data - omit each maximum(4)	0.0326	-	NA	NA	NA	NA	NA	NA	0.0152	-
Percent of BAT limits	86.9	-	-	-	-	-	-	-	6080	-

---

(1) Loads calculated from average and maximum concentrations applied to long term average flows reported by plants.
(2) BCT limits only (30-day average and maximum daily).
(3) BCT limits only (maximum daily limit only).
(4) Average value recalculated by discarding maximum concentration and dividing by one less than the total number of samples.

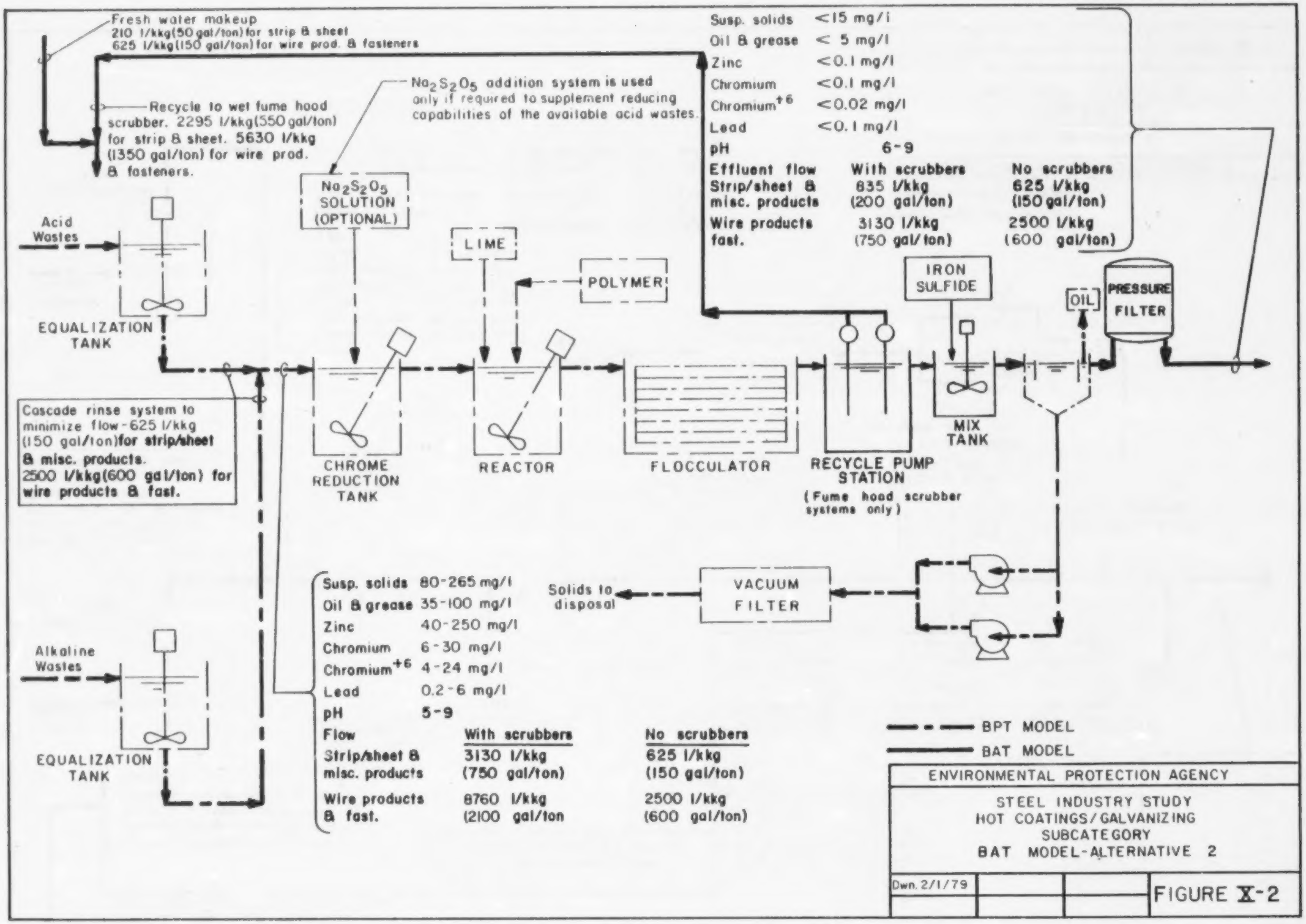
NA: Plant did not report any long term data on this parameter.
* : Plant 0612 has technology equivalent to BAT in place and operating well. Meets all limitations for which data are provided. Short term sampling indicates that effluent contains only 13% of the BAT average chromium limit.


Fresh water makeup
210 l/kkg(50 gal/ton) for strip & sheet
625 l/kkg(150 gal/ton) for wire prod. & fasteners
Recycle to wet fume hood scrubber. 2295 l/kkg(550 gal/ton) for strip & sheet. 5630 l/kkg (1350 gal/ton) for wire prod. & fasteners.
$Na_2S_2O_5$ addition system is used only if required to supplement reducing capabilities of the available acid wastes.
$Na_2S_2O_5$ SOLUTION (OPTIONAL)
LIME
POLYMER
Acid Wastes
EQUALIZATION TANK
Cascade rinse system to minimize flow-625 l/kkg (150 gal/ton) for strip/sheet & misc. products.
2500 l/kkg(600 gal/ton) for wire products & fast.
CHROME REDUCTION TANK
REACTOR
FLOCCULATOR
RECYCLE PUMP STATION
(Fume hood scrubber systems only)
CLARIFIER w/OIL SKIMMER
OIL
Susp. solids < 30 mg/l
Oil & grease < 5 mg/l
Zinc < 0.1 mg/l
Chromium < 0.1 mg/l
Chromium+6 < 0.02 mg/l
Lead < 0.1 mg/l
pH 6 - 9
Effluent flow | With scrubbers | No scrubbers
Strip/sheet & misc. products | 835 l/kkg (200 gal/ton) | 625 l/kkg (150 gal/ton)
Wire products & fast. | 3130 l/kkg (750 gal/ton) | 2500 l/kkg (600 gal/ton)
VACUUM FILTER
Solids to disposal
Alkaline Wastes
EQUALIZATION TANK
Susp. solids 80-265 mg/l
Oil & grease 35-100 mg/l
Zinc 40-250 mg/l
Chromium 6-30 mg/l
Chromium+6 4-24 mg/l
Lead 0.2-6 mg/l
pH 5-9
Flow = | With scrubbers | No scrubbers
Strip/sheet & misc. products | 3130 l/kkg (750 gal/ton) | 625 l/kkg (150 gal/ton)
Wire products & fast. | 8760 l/kkg (2100 gal/ton) | 2500 l/kkg (600 gal/ton)
BPT MODEL
BAT MODEL
Dwn. 1/31/79

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/GALVANIZING
SUBCATEGORY
BAT MODEL-ALTERNATIVE 1

FIGURE X-1

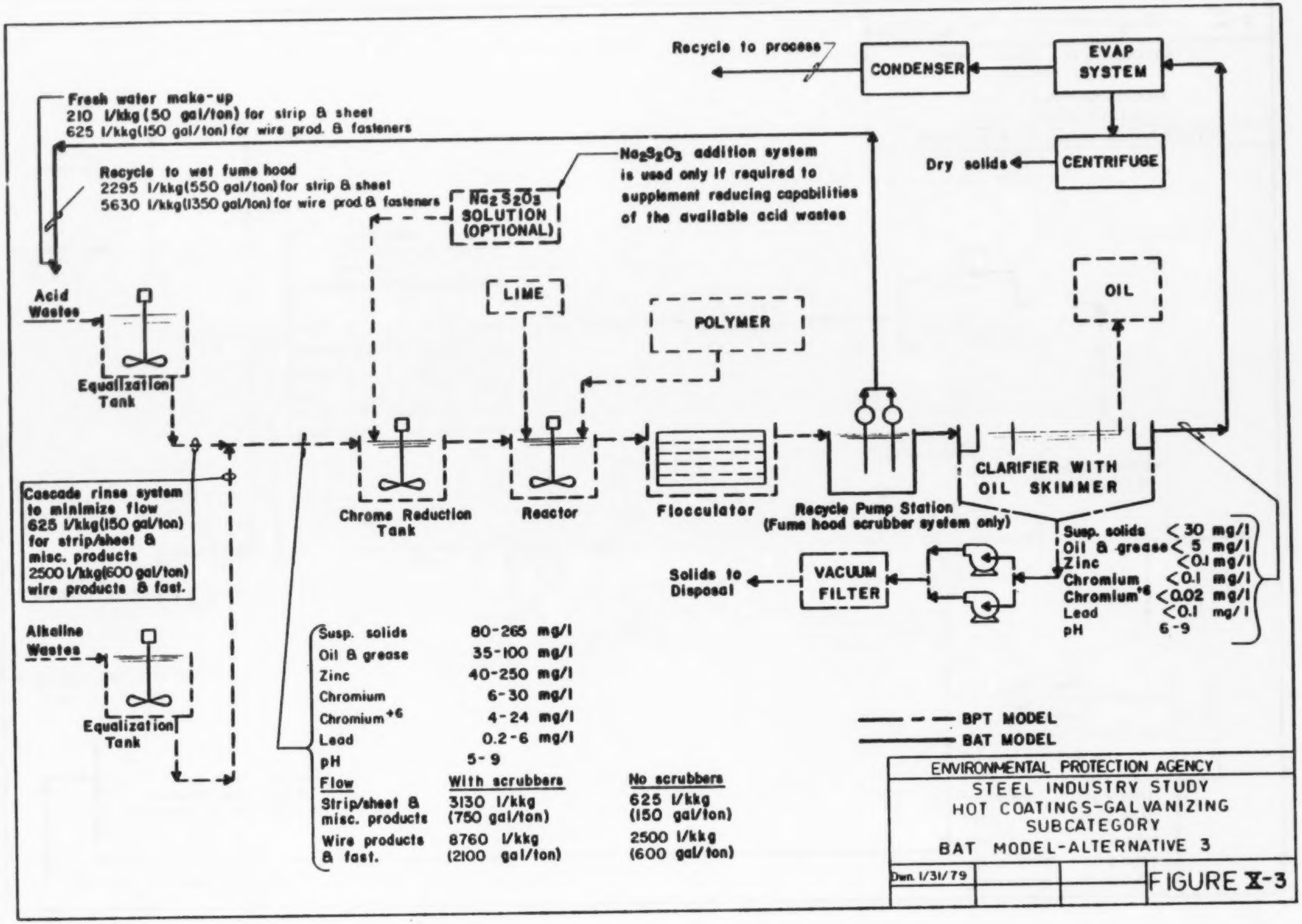

Fresh water makeup
210 l/kkg(50 gal/ton) for strip & sheet
625 l/kkg(150 gal/ton) for wire prod. & fasteners
Recycle to wet fume hood scrubber. 2295 l/kkg(550 gal/ton) for strip & sheet. 5630 l/kkg (1350 gal/ton) for wire prod. & fasteners.
$Na_2S_2O_5$ addition system is used only if required to supplement reducing capabilities of the available acid wastes.
$Na_2S_2O_5$ SOLUTION (OPTIONAL)
LIME
POLYMER
Acid Wastes
EQUALIZATION TANK
Cascade rinse system to minimize flow-625 l/kkg (150 gal/ton) for strip/sheet & misc. products. 2500 l/kkg(600 gal/ton) for wire products & fast.
CHROME REDUCTION TANK
REACTOR
FLOCCULATOR
RECYCLE PUMP STATION
(Fume hood scrubber systems only)
IRON SULFIDE
MIX TANK
OIL
PRESSURE FILTER
Susp. solids <15 mg/l
Oil & grease < 5 mg/l
Zinc <0.1 mg/l
Chromium <0.1 mg/l
Chromium+6 <0.02 mg/l
Lead <0.1 mg/l
pH 6-9
Effluent flow With scrubbers No scrubbers
Strip/sheet & misc. products 835 l/kkg (200 gal/ton) 625 l/kkg (150 gal/ton)
Wire products fast. 3130 l/kkg (750 gal/ton) 2500 l/kkg (600 gal/ton)
Alkaline Wastes
EQUALIZATION TANK
Susp. solids 80-265 mg/l
Oil & grease 35-100 mg/l
Zinc 40-250 mg/l
Chromium 6-30 mg/l
Chromium+6 4-24 mg/l
Lead 0.2-6 mg/l
pH 5-9
Flow With scrubbers No scrubbers
Strip/sheet & misc. products 3130 l/kkg (750 gal/ton) 625 l/kkg (150 gal/ton)
Wire products & fast. 8760 l/kkg (2100 gal/ton) 2500 l/kkg (600 gal/ton)
Solids to disposal
VACUUM FILTER
BPT MODEL
BAT MODEL

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/GALVANIZING
SUBCATEGORY
BAT MODEL-ALTERNATIVE 2

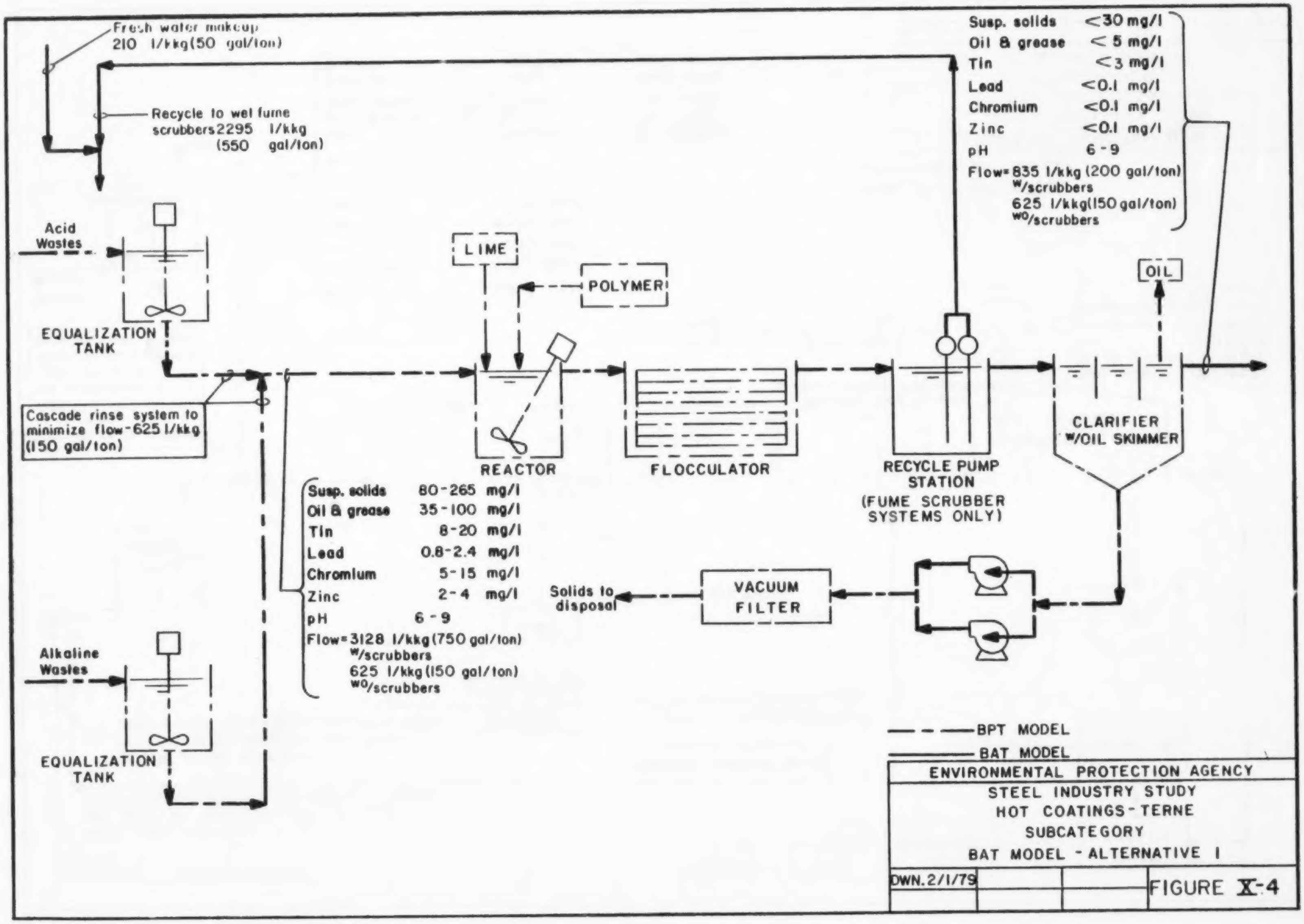
Dwn. 2/1/79

FIGURE X-2


Recycle to process
CONDENSER
EVAP SYSTEM
CENTRIFUGE
Dry solids
Fresh water make-up
210 l/kkg (50 gal/ton) for strip & sheet
625 l/kkg(150 gal/ton) for wire prod. & fasteners
Recycle to wet fume hood
2295 l/kkg(550 gal/ton) for strip & sheet
5630 l/kkg(1350 gal/ton) for wire prod. & fasteners
$Na_2S_2O_3$ SOLUTION (OPTIONAL)
$Na_2S_2O_3$ addition system is used only if required to supplement reducing capabilities of the available acid wastes
LIME
POLYMER
OIL
Acid Wastes
Equalization Tank
Cascade rinse system to minimize flow 625 l/kkg(150 gal/ton) for strip/sheet & misc. products 2500 l/kkg(600 gal/ton) wire products & fast.
Chrome Reduction Tank
Reactor
Flocculator
Recycle Pump Station (Fume hood scrubber system only)
CLARIFIER WITH OIL SKIMMER
Susp. solids < 30 mg/l
Oil & grease < 5 mg/l
Zinc < 0.1 mg/l
Chromium < 0.1 mg/l
Chromium+6 < 0.02 mg/l
Lead < 0.1 mg/l
pH 6-9
Solids to Disposal
VACUUM FILTER
Alkaline Wastes
Equalization Tank
Susp. solids 80-265 mg/l
Oil & grease 35-100 mg/l
Zinc 40-250 mg/l
Chromium 6-30 mg/l
Chromium+6 4-24 mg/l
Lead 0.2-6 mg/l
pH 5-9
Flow / With scrubbers / No scrubbers
Strip/sheet & misc. products 3130 l/kkg (750 gal/ton) 625 l/kkg (150 gal/ton)
Wire products & fast. 8760 l/kkg (2100 gal/ton) 2500 l/kkg (600 gal/ton)
BPT MODEL
BAT MODEL
Dwn. 1/31/79

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS-GALVANIZING
SUBCATEGORY
BAT MODEL-ALTERNATIVE 3

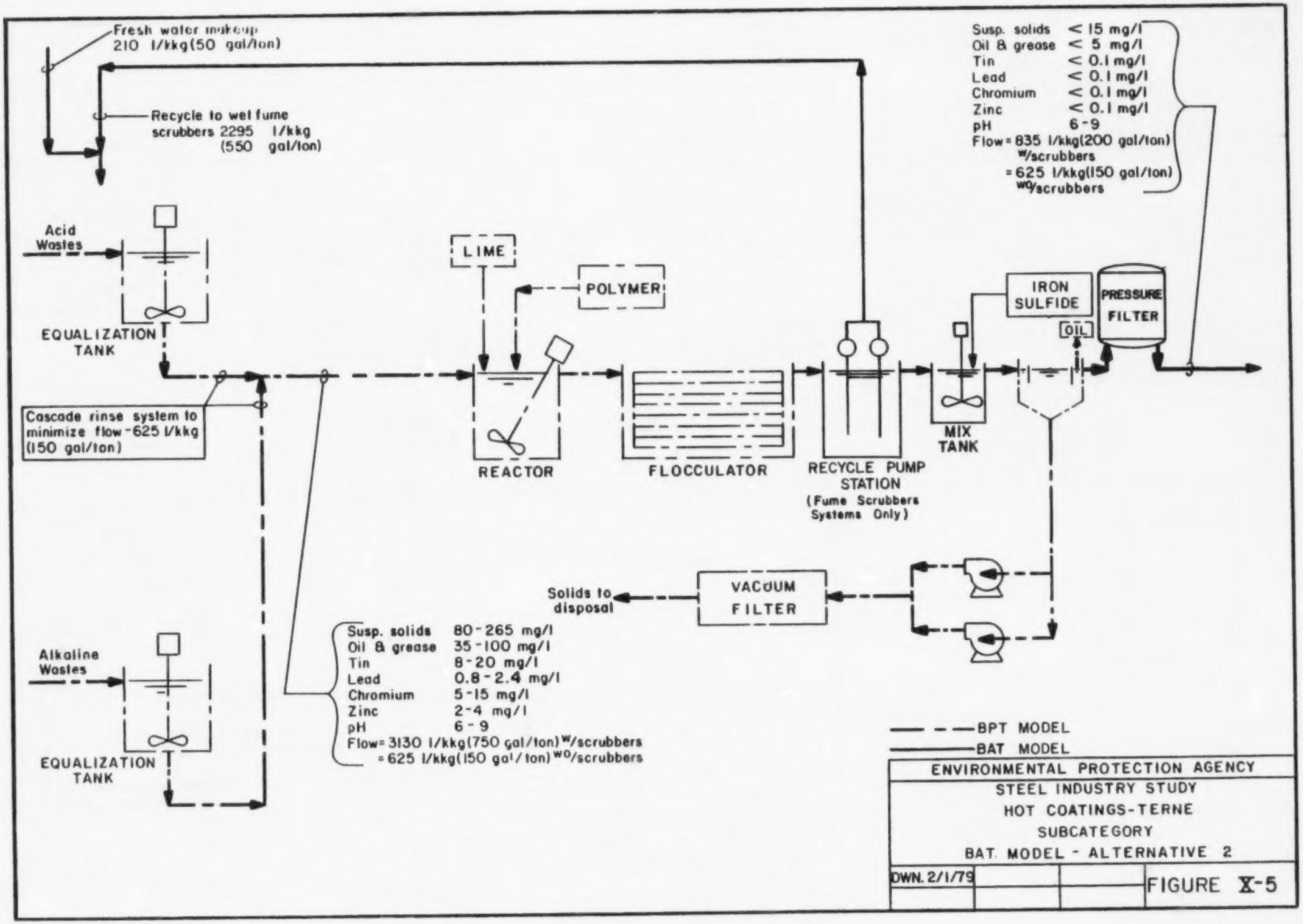
FIGURE X-3



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS - TERNE
SUBCATEGORY
BAT MODEL - ALTERNATIVE I

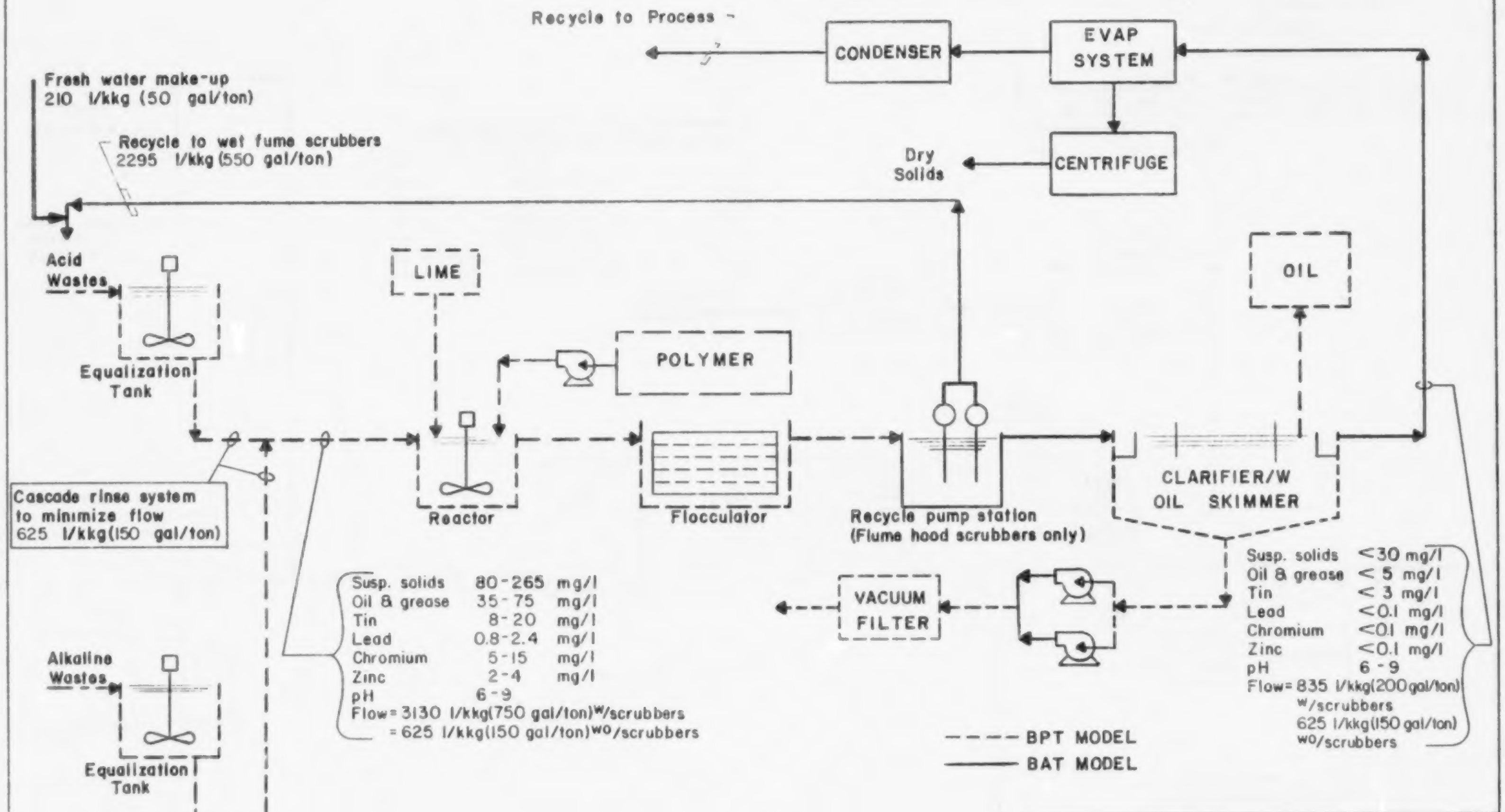
DWN. 2/1/79

FIGURE X-4



ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS-TERNE
SUBCATEGORY
BAT. MODEL - ALTERNATIVE 2

FIGURE X-5

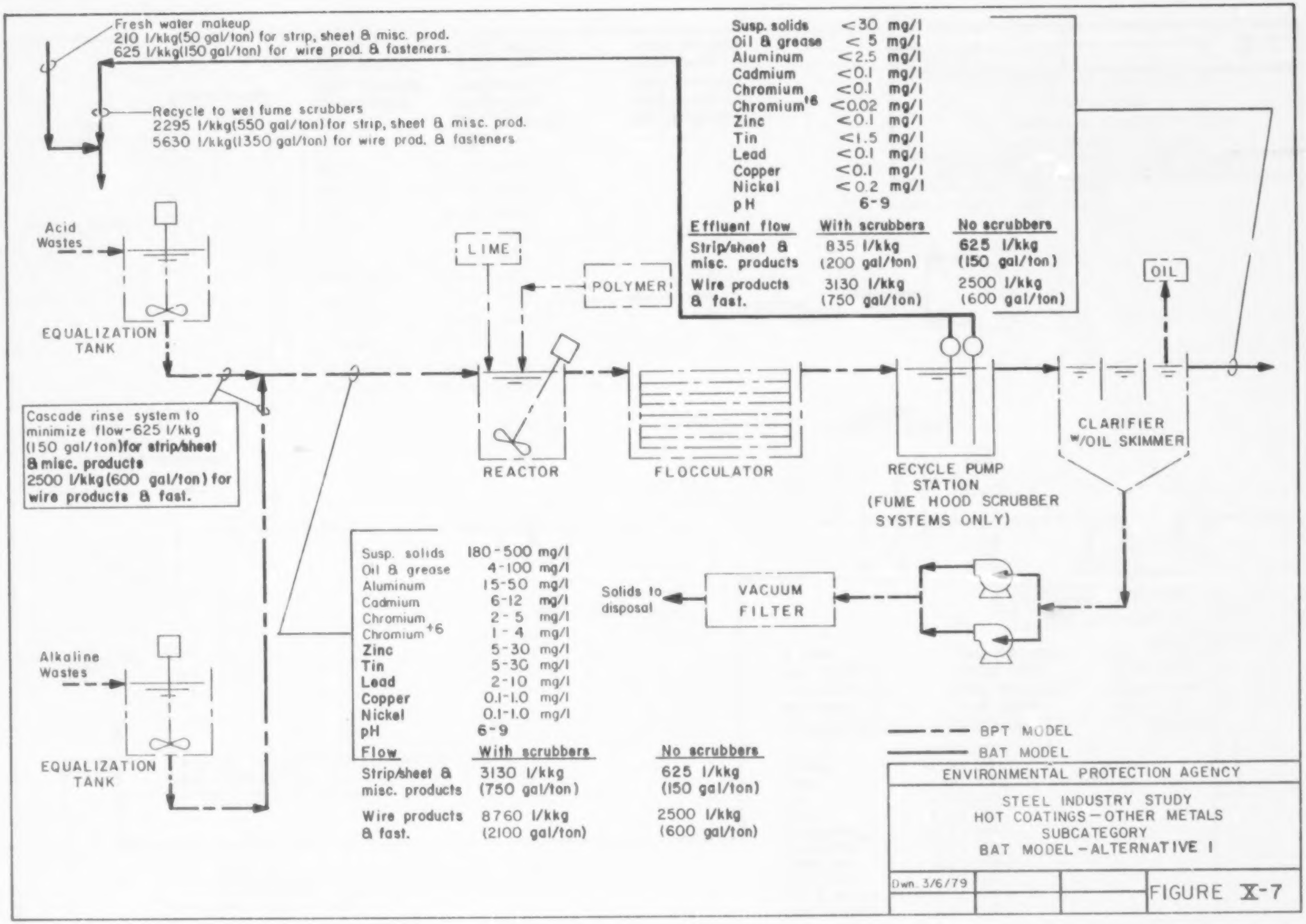


ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS-TERNE
SUBCATEGORY
BAT MODEL-ALTERNATIVE 3

DWN. 10-28-77

FIGURE X-6


Fresh water makeup
210 l/kkg(50 gal/ton) for strip, sheet & misc. prod.
625 l/kkg(150 gal/ton) for wire prod. & fasteners.
Recycle to wet fume scrubbers
2295 l/kkg(550 gal/ton) for strip, sheet & misc. prod.
5630 l/kkg(1350 gal/ton) for wire prod. & fasteners
Acid Wastes
EQUALIZATION TANK
LIME
POLYMER
REACTOR
FLOCCULATOR
RECYCLE PUMP STATION (FUME HOOD SCRUBBER SYSTEMS ONLY)
OIL
CLARIFIER w/OIL SKIMMER
Solids to disposal
VACUUM FILTER
Alkaline Wastes
EQUALIZATION TANK
BPT MODEL
BAT MODEL
Dwn. 3/6/79

Cascade rinse system to minimize flow-625 l/kkg (150 gal/ton) for strip/sheet & misc. products
2500 l/kkg(600 gal/ton) for wire products & fast.

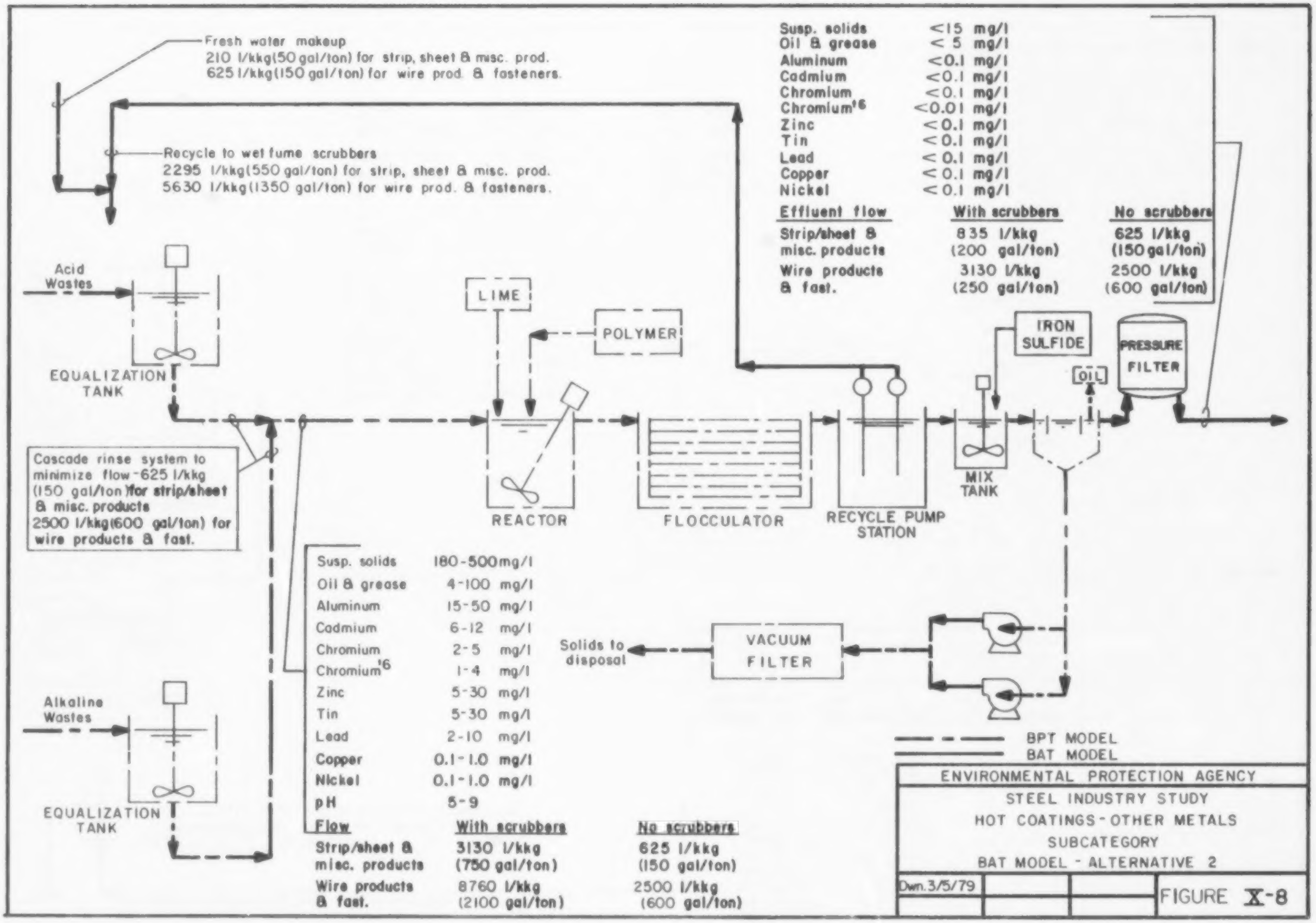
Susp. solids	180-500 mg/l	
Oil & grease	4-100 mg/l	
Aluminum	15-50 mg/l	
Cadmium	6-12 mg/l	
Chromium	2-5 mg/l	
Chromium^{+6}	1-4 mg/l	
Zinc	5-30 mg/l	
Tin	5-30 mg/l	
Lead	2-10 mg/l	
Copper	0.1-1.0 mg/l	
Nickel	0.1-1.0 mg/l	
pH	6-9	
Flow	**With scrubbers**	**No scrubbers**
Strip/sheet & misc. products	3130 l/kkg (750 gal/ton)	625 l/kkg (150 gal/ton)
Wire products & fast.	8760 l/kkg (2100 gal/ton)	2500 l/kkg (600 gal/ton)

Susp. solids	<30 mg/l	
Oil & grease	< 5 mg/l	
Aluminum	<2.5 mg/l	
Cadmium	<0.1 mg/l	
Chromium	<0.1 mg/l	
Chromium^{+6}	<0.02 mg/l	
Zinc	<0.1 mg/l	
Tin	<1.5 mg/l	
Lead	<0.1 mg/l	
Copper	<0.1 mg/l	
Nickel	<0.2 mg/l	
pH	6-9	
Effluent flow	**With scrubbers**	**No scrubbers**
Strip/sheet & misc. products	835 l/kkg (200 gal/ton)	625 l/kkg (150 gal/ton)
Wire products & fast.	3130 l/kkg (750 gal/ton)	2500 l/kkg (600 gal/ton)

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS — OTHER METALS
SUBCATEGORY
BAT MODEL — ALTERNATIVE I

FIGURE X-7


Fresh water makeup
210 l/kkg(50 gal/ton) for strip, sheet & misc. prod.
625 l/kkg(150 gal/ton) for wire prod. & fasteners.
Recycle to wet fume scrubbers
2295 l/kkg(550 gal/ton) for strip, sheet & misc. prod.
5630 l/kkg(1350 gal/ton) for wire prod. & fasteners.
Acid Wastes
EQUALIZATION TANK
Cascade rinse system to minimize flow - 625 l/kkg (150 gal/ton) for strip/sheet & misc. products
2500 l/kkg(600 gal/ton) for wire products & fast.
Alkaline Wastes
EQUALIZATION TANK
LIME
POLYMER
REACTOR
FLOCCULATOR
RECYCLE PUMP STATION
IRON SULFIDE
MIX TANK
OIL
PRESSURE FILTER
VACUUM FILTER
Solids to disposal
BPT MODEL
BAT MODEL

Susp. solids	180-500 mg/l
Oil & grease	4-100 mg/l
Aluminum	15-50 mg/l
Cadmium	6-12 mg/l
Chromium	2-5 mg/l
Chromium+6	1-4 mg/l
Zinc	5-30 mg/l
Tin	5-30 mg/l
Lead	2-10 mg/l
Copper	0.1-1.0 mg/l
Nickel	0.1-1.0 mg/l
pH	5-9

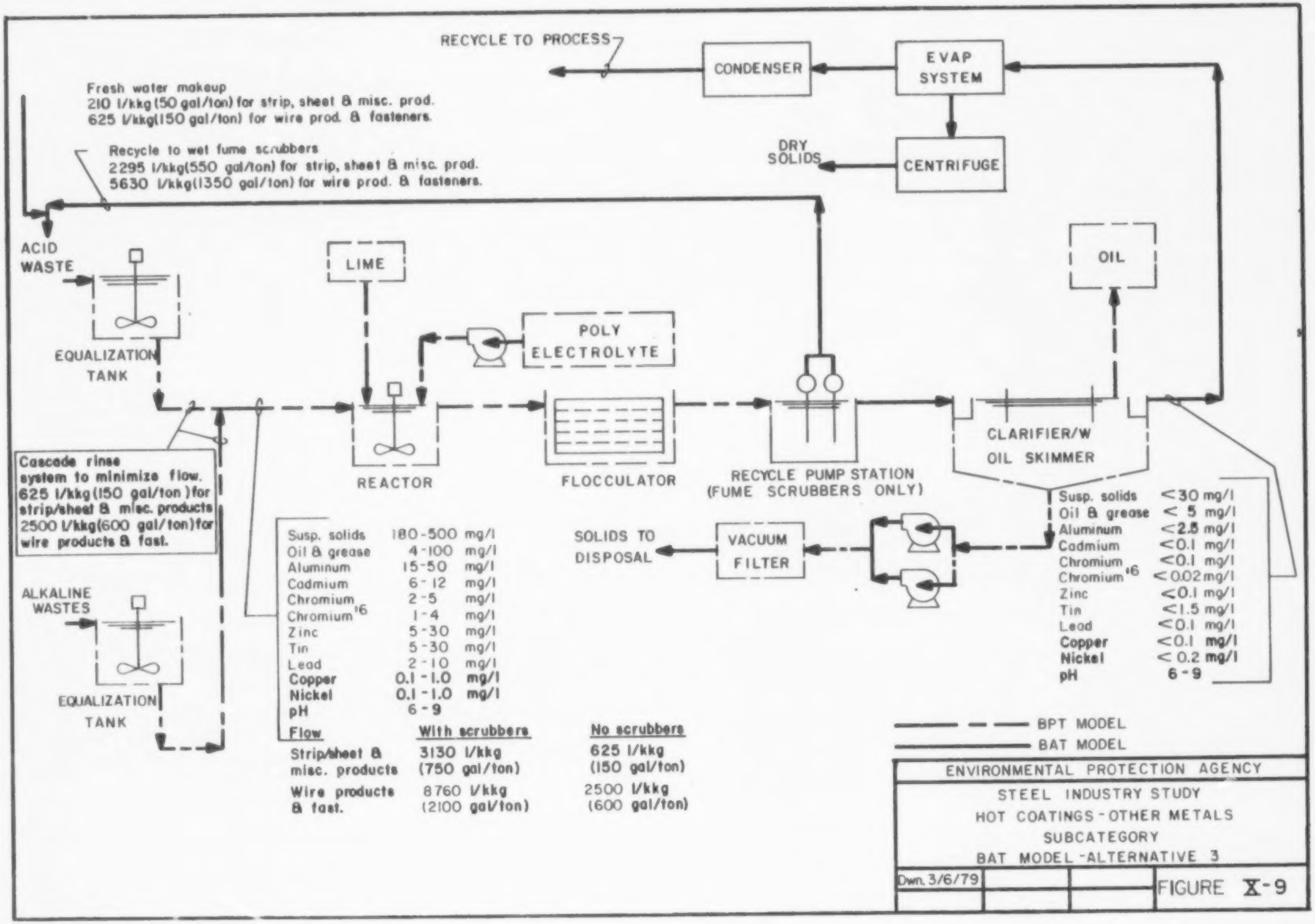
Flow	With scrubbers	No scrubbers
Strip/sheet & misc. products	3130 l/kkg (750 gal/ton)	625 l/kkg (150 gal/ton)
Wire products & fast.	8760 l/kkg (2100 gal/ton)	2500 l/kkg (600 gal/ton)

Susp. solids	<15 mg/l
Oil & grease	< 5 mg/l
Aluminum	<0.1 mg/l
Cadmium	<0.1 mg/l
Chromium	<0.1 mg/l
Chromium+6	<0.01 mg/l
Zinc	<0.1 mg/l
Tin	<0.1 mg/l
Lead	<0.1 mg/l
Copper	<0.1 mg/l
Nickel	<0.1 mg/l

Effluent flow	With scrubbers	No scrubbers
Strip/sheet & misc. products	835 l/kkg (200 gal/ton)	625 l/kkg (150 gal/ton)
Wire products & fast.	3130 l/kkg (250 gal/ton)	2500 l/kkg (600 gal/ton)

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS - OTHER METALS
SUBCATEGORY
BAT MODEL - ALTERNATIVE 2
Dwn. 3/5/79

FIGURE X-8


RECYCLE TO PROCESS
CONDENSER
EVAP SYSTEM
DRY SOLIDS
CENTRIFUGE
Fresh water makeup
210 l/kkg (50 gal/ton) for strip, sheet & misc. prod.
625 l/kkg(150 gal/ton) for wire prod. & fasteners.
Recycle to wet fume scrubbers
2295 l/kkg(550 gal/ton) for strip, sheet & misc. prod.
5630 l/kkg(1350 gal/ton) for wire prod. & fasteners.
ACID WASTE
EQUALIZATION TANK
LIME
POLY ELECTROLYTE
OIL
REACTOR
FLOCCULATOR
RECYCLE PUMP STATION (FUME SCRUBBERS ONLY)
CLARIFIER/W OIL SKIMMER
SOLIDS TO DISPOSAL
VACUUM FILTER
ALKALINE WASTES
EQUALIZATION TANK
BPT MODEL
BAT MODEL
Dwn. 3/6/79

Cascade rinse system to minimize flow. 625 l/kkg (150 gal/ton) for strip/sheet & misc. products 2500 l/kkg(600 gal/ton) for wire products & fast.

Susp. solids	180-500 mg/l
Oil & grease	4-100 mg/l
Aluminum	15-50 mg/l
Cadmium	6-12 mg/l
Chromium	2-5 mg/l
Chromium $^{+6}$	1-4 mg/l
Zinc	5-30 mg/l
Tin	5-30 mg/l
Lead	2-10 mg/l
Copper	**0.1-1.0 mg/l**
Nickel	**0.1-1.0 mg/l**
pH	**6-9**

Flow	With scrubbers	No scrubbers
Strip/sheet & misc. products	3130 l/kkg (750 gal/ton)	625 l/kkg (150 gal/ton)
Wire products & fast.	8760 l/kkg (2100 gal/ton)	2500 l/kkg (600 gal/ton)

Susp. solids	<30 mg/l
Oil & grease	< 5 mg/l
Aluminum	<2.5 mg/l
Cadmium	<0.1 mg/l
Chromium	<0.1 mg/l
Chromium $^{+6}$	<0.02 mg/l
Zinc	<0.1 mg/l
Tin	<1.5 mg/l
Lead	<0.1 mg/l
Copper	**<0.1 mg/l**
Nickel	**< 0.2 mg/l**
pH	**6-9**

ENVIRONMENTAL PROTECTION AGENCY
STEEL INDUSTRY STUDY
HOT COATINGS - OTHER METALS
SUBCATEGORY
BAT MODEL - ALTERNATIVE 3

FIGURE X-9

HOT COATING SUBCATEGORY

SECTION XI

BEST CONVENTIONAL POLLUTANT CONTROL TECHNOLOGY (BCT)

Introduction

The 1977 Amendments added Section 301(b)(4)(E) to the Act, establishing "best conventional pollutant control technology" (BCT) for discharges of conventional pollutants from existing industrial point sources. Conventional pollutants are those defined in Section 304(g)(4) - BOD, TSS, fecal coliform and pH - and any additional pollutants defined by the Administrator as "conventional." On July 28, 1978, EPA proposed that COD, oil and grease, and phosphorus be added to the conventional pollutant list (43 Fed.Reg. 32857). Only oil and grease was added.

BCT is not an additional limitation, but replaces BAT for the control of conventional pollutants. BCT requires that limitations for conventional pollutants be assessed in light of a new "cost-reasonableness" test, which involves a comparison of the cost and level of reduction of such pollutants from a class or category of industrial sources. As part of its review of BCT for certain "secondary" industries, EPA proposed methodology for this cost test. (See 43 Fed.Reg. 37570, August 23, 1978).

For hot coating operations, the conventional pollutants of concern are total suspended solids, oils and greases, and pH. The proposed pH limitations are identical for BPT and BCT, so the need to justify the control of pH under BCT cost test guidelines is obviated.

Development of BCT

Two BCT alternative treatment systems are shown in Figure XI-1. The first alternative includes cascade rinsing and recycle of fume hood scrubbers, while the second alternative includes filtration of the resultant effluent from Alternative No. 1.

The costs of treating TSS and O&G to more stringent levels were estimated for the two BCT alternative treatment systems and were presented in Section VIII. A summary of that industry/POTW cost comparison follows.

	Costs in $/lb of Conventional Pollutant Removed POTW	Alt.1	Alt.2
Galvanizing			
Strip/Sheet/ Misc., w/scrub	1.34	0.58	0.75
Strip/Sheet/ Misc.,wo/scrub	1.34	0.99	1.27
Wire Prod. & Fast.,w/scrub	1.34	0.53	0.87
Wire Prod. & Fast.,wo/scrub	1.34	0.57	1.10
Terne Coating			
Strip/Sheet/ Misc., w/scrub	1.34	0.87	1.15
Strip/Sheet/ Misc.,wo/scrub	1.34	1.36	1.82
Other Metal Coatings			
Strip/Sheet/ Misc., w/scrub	1.34	0.75	1.02
Strip/Sheet/ Misc.,wo/scrub	1.34	1.20	1.66
Wire Prod. & Fast.,w/scrub	1.34	1.54	2.88
Wire Prod. & Fast.,wo/scrub	1.34	1.21	3.31

Selection of a BCT Alternative

With two exceptions, the BCT Alternative 1 technology passes the cost test, and with four exceptions, the BCT Alternative 2 technology passes the cost tests. On this basis, the proposed BCT limitations are based upon the proposed BPT limits (terne-coating without scrubbers and other metal coatings-wire products and fasteners with scrubbers); BCT-1 (other metal coatings - strip, sheet, and miscellaneous products without scrubbers, and wire products and fasteners without scrubbers); and BCT-2 for the six remaining segments. Proposed BCT limitations for each of the hot coating subdivisions are shown in Tables XI-1 through XI-3.

Development of BCT Limitations

The Agency is proposing limitations for suspended solids, oil and grease, and pH at BCT for all hot coating segments. The BCT limitations for terne coating without scrubbers and other metal coatings - wire products and fasteners with scrubbers are the same as the respective BPT limitations. The BCT limitations for all other segments of the hot coating subcategory are based on the BCT Alternative 1 or Alternative 2 as discussed above.

TABLE XI-1

BCT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - GALVANIZING

BCT Effluent Limitations in kg/kkg (lbs/1000 lbs)

	TSS(1)	Oil and Grease(2)	pH Units	Flow Basis BPT
A. Alternative 1*				
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	6-9	150
Add to A1 for Scrubbers	0.00313	0.00209	6-9	50
2. Wire Products & Fast. Basic	0.0375	0.0250	6-9	600
Add to A2 for Scrubbers	0.00938	0.00626	6-9	150
B. Alternative 2				
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	6-9	150
Add to A1 for Scrubbers	0.00313	0.00209	6-9	50
2. Wire Products & Fast. Basic	0.0375	0.0250	6-9	600
Add to A2 for Scrubbers	0.00938	0.00626	6-9	150

---

(1) 30-day average limitations. Daily maximum values are 2.67 times the limitations stated.
(2) Daily maximum limitations only. There is no 30-day average limitation for Oil and Grease.

*: Selected BCT alternative.

TABLE XI-2

BCT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - TERNE METAL

BCT Effluent Limitations in kg/kkg (lbs/1000 lbs)

	TSS(1)	Oil and Grease(2)	pH Units	Flow Basis BPT
A. Alternative 1*				
Strip, Sheet, Misc. Prod. Lines:				
Without Scrubbers	0.125	0.0375	6-9	600
With Scrubbers	0.0125	0.00834	6-9	200
B. Alternative 2				
Strip Sheet, Misc. Product Lines:				
Without Scrubbers	0.125	0.0375	6-9	600
With Scrubbers	0.0125	0.00834	6-9	200

---

(1) 30-day average limitations. Daily maximum values are 2.67 times the stated limitation for lines with scrubbers, and 3 times the stated limitation for lines without scrubbers.

(2) Daily maximum limitations only. There is no 30-day average limitation for Oil and Grease.

*: Selected BCT alternative.

TABLE XI-3

BCT EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - OTHER METALLIC COATINGS

BCT Effluent Limitations in kg/kkg (lbs/1000 lbs)

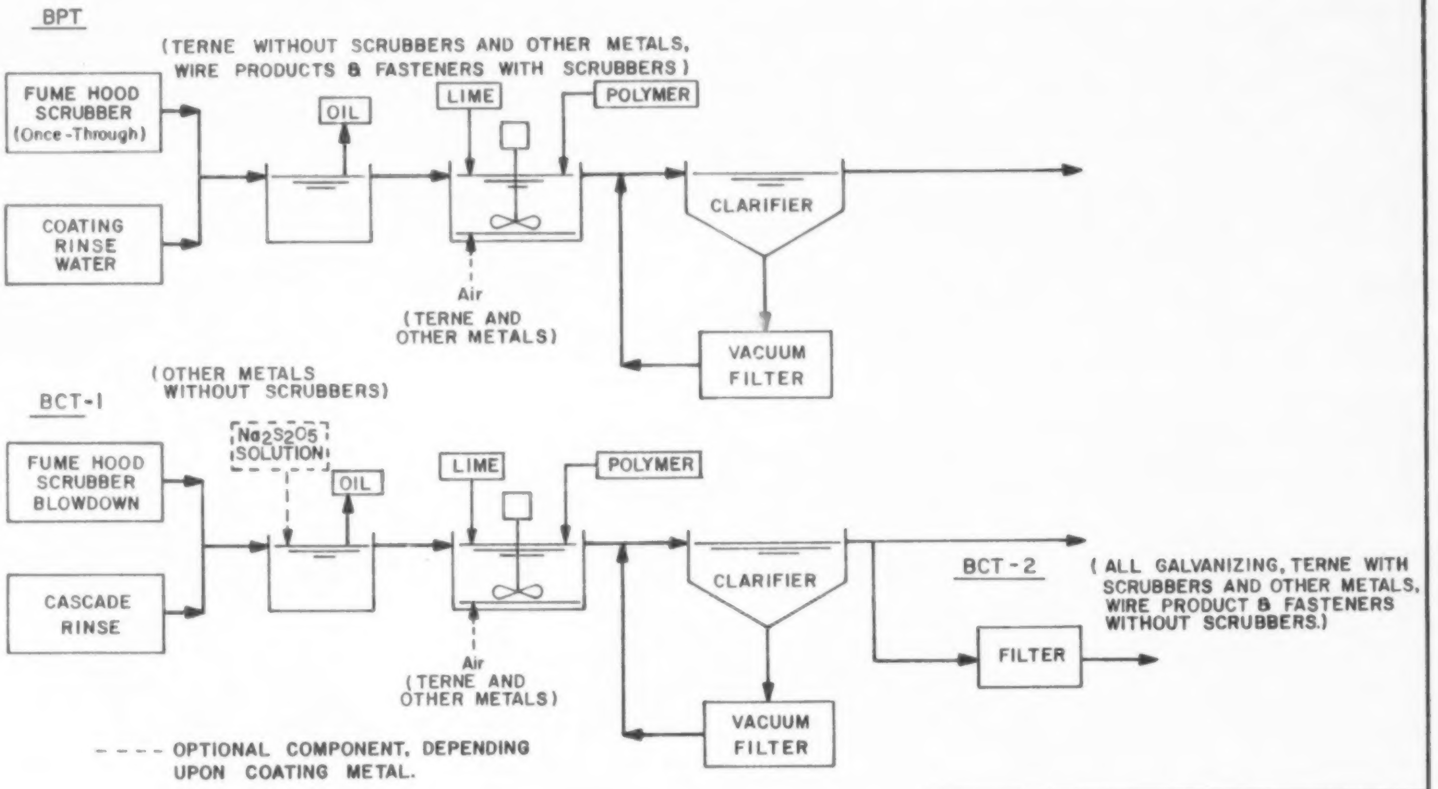
	TSS(1)	Oil and Grease(2)	pH Units	Flow Basis BPT
A. Alternative 1*				
1. Strip, Sheet, Misc. Prod. Lines:				
Without Scrubbers	0.0188	0.00626	6-9	150
With Scrubbers	0.0125	0.00834	6-9	200
2. Wire Product & Fast. Lines:				
Without Scrubbers	0.0751	0.0250(3)	6-9	600
With Scrubbers	0.813	0.244(3)	6-9	3900
B. Alternative 2				
1. Strip Sheet, Misc. Product Lines:				
Without Scrubbers	0.0188	0.00626	6-9	150
With Scrubbers	0.0125	0.00834	6-9	200
2. Wire Products & Fast. Lines:				
Without Scrubbers	0.0751	0.0250(3)	6-9	600
With Scrubbers	0.813	0.244(3)	6-9	3900

---

(1) 30-day average limitations. Daily maximum values are 2.0 times the stated limitation for lines with no scrubbers, and 2.67 times the stated limitation for strip, sheet, & misc. prod. lines with scrubbers and 3.0 times the stated limitation for wire product & fastener lines with scrubbers.

(2) With one exception (see note 3) these are daily maximum limitations only.

(3) 30-day average limitation. Daily maximum values are 3.0 times the stated limitation.


BPT
(TERNE WITHOUT SCRUBBERS AND OTHER METALS, WIRE PRODUCTS & FASTENERS WITH SCRUBBERS)
FUME HOOD SCRUBBER (Once-Through)
COATING RINSE WATER
OIL
LIME
POLYMER
CLARIFIER
Air
(TERNE AND OTHER METALS)
VACUUM FILTER
BCT-1
(OTHER METALS WITHOUT SCRUBBERS)
FUME HOOD SCRUBBER BLOWDOWN
CASCADE RINSE
Na2S2O5 SOLUTION
OIL
LIME
POLYMER
CLARIFIER
Air
(TERNE AND OTHER METALS)
VACUUM FILTER
BCT - 2
(ALL GALVANIZING, TERNE WITH SCRUBBERS AND OTHER METALS, WIRE PRODUCT & FASTENERS WITHOUT SCRUBBERS.)
FILTER
- - - - OPTIONAL COMPONENT, DEPENDING UPON COATING METAL.

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS SUBCATEGORY
ALL METALS
BCT MODELS SUMMARY

Dwn. 11/20/80

FIGURE XI 1

HOT COATING SUBCATEGORY

SECTION XII

EFFLUENT QUALITY ATTAINABLE THROUGH THE APPLICATION OF NEW SOURCE PERFORMANCE STANDARDS (NSPS)

Introduction

The effluent limitations which must be achieved by new sources, i.e., any source, the construction of which is started after proposal of new source performance standards, are to specify the degree of effluent reduction achievable through the application of the best available demonstrated control technology, processes, operating methods, or other alternatives, including, where practicable, a standard permitting no discharge of pollutants.

For this subcategory, several plants in the industry are reported to operate with no discharge. On the basis of demonstrated performance at Plant 0856N, the Agency believes this option is viable for batch pipe and tube galvanizing operations. However, the technology employed at this plant may not be universally applicable to all hot coating operations. A "no discharge of pollutants" limit is possible for all hot coating operations through the use of advanced technologies, e.g., vapor compression and distillation (BAT Alternative 3) which have yet to be demonstrated on wastewaters from hot coating operations. The technology exists and is listed as a possible alternative for BAT.

Identification of NSPS Technology

The Agency considered two alternative treatment systems for new hot coating operations. Variations in flow, product, and metal coating affect the costs as shown in Tables VIII-14 through VIII-16, but the basic treatment systems are very similar. Refer to Figure XII-1 and XII-2 for NSPS treatment systems, and to Tables XII-1 through XII-3 for the individual limitations.

NSPS Alternative 1

All new hot coating lines have the opportunity to minimize process wastewater flows with cascade rinsing systems. Also, for those lines with fume scrubbers, consideration is made for installing recycle loops for scrubber wastewaters with minimum blowdowns to treatment. These flow reduction methods should be part of all NSPS treatment systems, since the extensive degree of treatment to follow is most economically done on the smallest possible volumes. The remaining steps in Alternative 1 include chromium reduction where necessary, precipitation and flocculation with lime and polymers, clarification with vacuum filtration of clarifier underflows, and recycle of a portion of the treated wastewater back to the process. For discussion of the efficacy of this sequence, refer to individual pollutant loads in Section X, in particular to data from Plant 119. Note that although costs are higher for NSPS than for BAT, the technologies include much that is considered part of BPT for existing plants. Thus, NSPS is less expensive for new plants than the sum of BPT plus BAT for existing plants, primarily because flow reductions occur before other treatment facilities, so that smaller components are required to achieve the same results.

NSPS Alternative 2

Alternative 2 includes all steps and components shown in Alternative 1, plus two additional steps. The clarifier overflow is further polished with ferrous sulfide precipitation of dissolved metals, followed by filtration using a deep bed pressure filter. Improved solids and oil removals are obtained at modest increase in costs. Filtration technology is currently practiced successfully by Plant 116. Refer to data tables and discussion in Section X.

Selection of NSPS

As in the case of BAT, the Agency selected NSPS Alternative 1 as the NSPS model treatment system upon which the proposed new source performance standards are based.

TABLE XII-1

NSPS Effluent Limitations Guidelines
Hot Coating - Galvanizing

NSPS Effluent Limitations in kg/kkg (lbs/1000 lbs)[1]

	TSS[2]	O&G[3]	Chromium	Lead	Zinc	pH Units	Flow Basis GPT
A. Alternative 1*							
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	0.000063	0.000063	0.000063	6-9	150
Add to A1 for scrubbers	0.00313	0.00209	0.000021	0.000021	0.000021	6-9	50
2. Wire Products & Fast. Basic	0.0375	0.0250	0.000250	0.000250	0.000250	6-9	600
Add to A2 for scrubbers	0.00938	0.00626	0.000063	0.000063	0.000063	6-9	150
B. Alternative 2							
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	0.000063	0.000063	0.000063	6-9	150
Add to B1 for scrubbers	0.00313	0.00209	0.000021	0.000021	0.000021	6-9	50
2. Wire Products & Fast. Basic	0.0375	0.0250	0.000250	0.000250	0.000250	6-9	600
Add to B2 for scrubbers	0.00938	0.00626	0.000063	0.000063	0.000063	6-9	150

---

(1) 30-day average limitations. Daily maximum values are three times the limitations stated, except for TSS and O&G. See Notes (2) and (3).
(2) Daily maximum values for TSS are 2.67 times the limitations stated.
(3) Daily maximum limit only. There is no 30-day average limit for oil and grease.

*: Selected NSPS alternative.

TABLE XII-2

NSPS Effluent Limitations Guidelines
Hot Coating - Terne Metal

NSPS Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	TSS(2)	O&G(3)	Chromium	Lead	Zinc	pH Units	Flow Basis GPT
A. Alternative 1*							
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	0.000063	0.000063	0.000063	6-9	150
Add to A1 for scrubbers	0.00313	0.00209	0.000021	0.000021	0.000021	6-9	50
B. Alternative 2							
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	0.000063	0.000063	0.000063	6-9	150
Add to B1 for scrubbers	0.00313	0.00209	0.000021	0.000021	0.000021	6-9	50

---

(1) 30-day average limitations. Daily maximum values are three times the limitations stated, except for TSS and O&G. See Notes (2) and (3).
(2) Daily maximum values for TSS are 2.67 times the limitations stated.
(3) Daily maximum limit only. There is no 30-day average limit for oil and grease.

*: Selected NSPS alternative.

TABLE XII-3

NSPS EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - OTHER METALLIC COATINGS

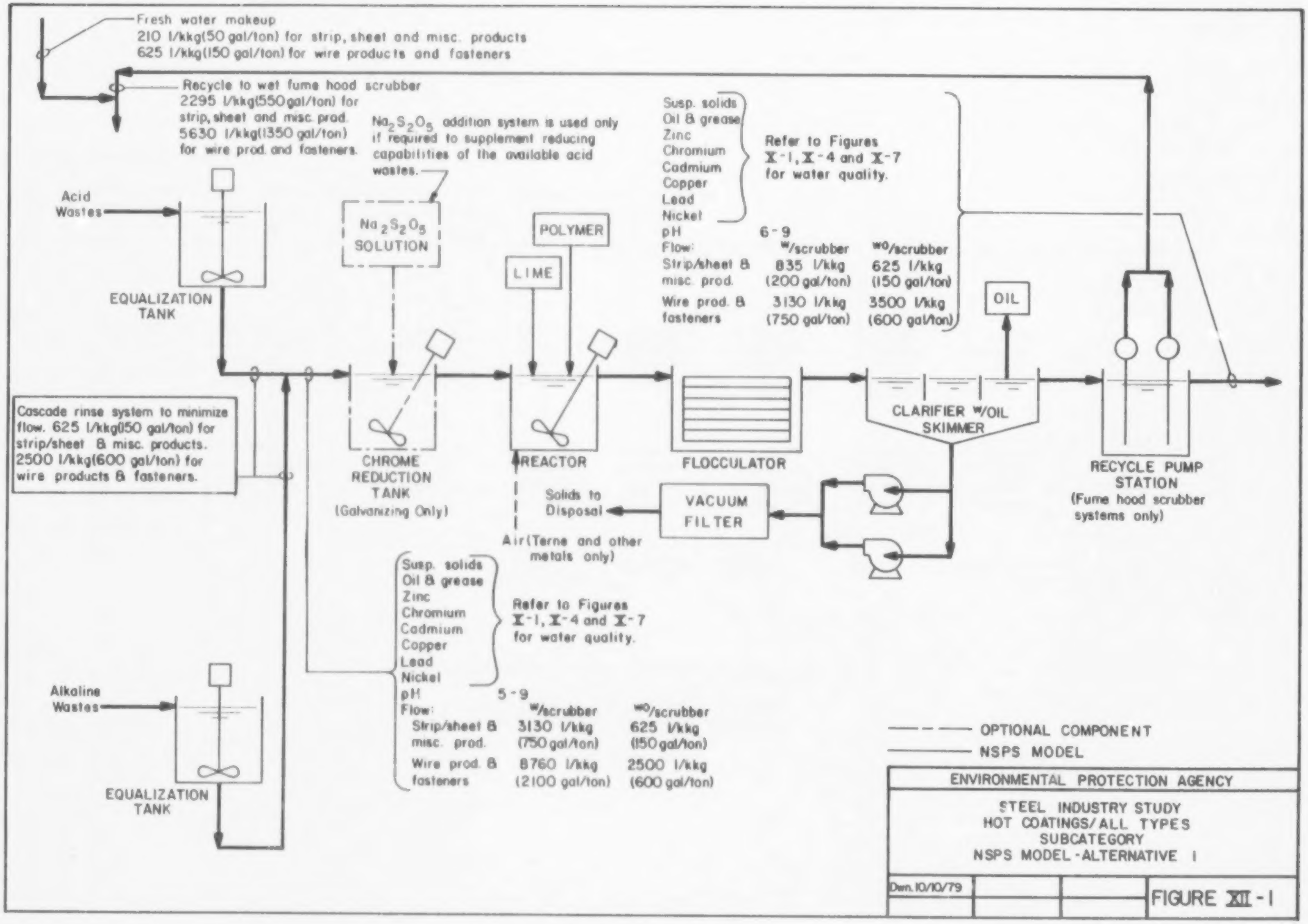
NSPS Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	TSS	O&G(3)	Chromium	Lead	Zinc	Cadmium(4)	pH Units	Flow Basis GPT
A. Alternative 1*								
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	0.000063	0.000063	0.000063	0.000063	6-9	150
Add to A1 for scrubbers	0.00313	0.00209	0.000021	0.000021	0.000021	0.00021	6-9	50
2. Wire Products & Fast. Basic	0.0375	0.0250	0.000250	0.000250	0.000250	0.000250	6-9	600
Add to A2 for scrubbers	0.00938	0.00626	0.000063	0.000063	0.000063	0.000063	6-9	150
B. Alternative 2								
1. Strip, Sheet, Misc. Prod. Basic	0.00938	0.00626	0.000063	0.000063	0.000063	0.000063	6-9	150
Add to B1 for scrubbers	0.00313	0.00209	0.000021	0.000021	0.000021	0.00021	6-9	50
2. Wire Products & Fast. Basic	0.0375	0.0250	0.000250	0.000250	0.000250	0.000250	6-9	600
Add to B2 for scrubbers	0.00938	0.00626	0.000063	0.000063	0.000063	0.000063	6-9	150

---

(1) 30-day average limitations. Daily maximum values are three times the limitations stated, except for TSS and O&G. See Notes (2) and (3).
(2) Daily maximum values for TSS are 2.67 times the limitations stated.
(3) Daily maximum limit only. There is no 30-day average limit for oil and grease.
(4) Limits on cadmium apply only to operations which use cadmium as a coating metal.

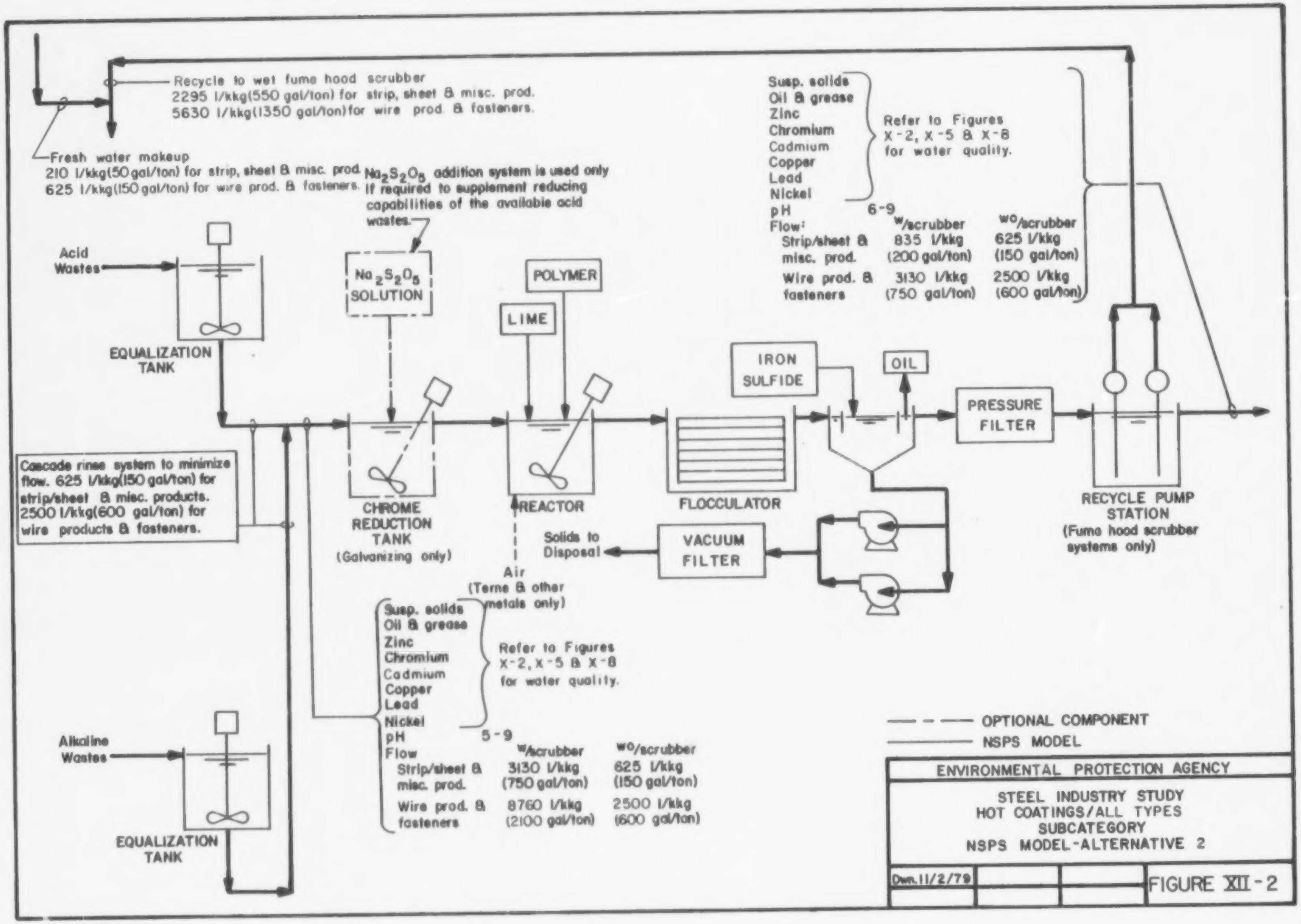
*: Selected NSPS alternative.


Fresh water makeup
210 l/kkg(50 gal/ton) for strip, sheet and misc. products
625 l/kkg(150 gal/ton) for wire products and fasteners
Recycle to wet fume hood scrubber
2295 l/kkg(550 gal/ton) for strip, sheet and misc. prod.
5630 l/kkg(1350 gal/ton) for wire prod. and fasteners.
$Na_2S_2O_5$ addition system is used only if required to supplement reducing capabilities of the available acid wastes.
Acid Wastes
EQUALIZATION TANK
$Na_2S_2O_5$ SOLUTION
POLYMER
LIME
Susp. solids
Oil & grease
Zinc
Chromium
Cadmium
Copper
Lead
Nickel
Refer to Figures X-1, X-4 and X-7 for water quality.
pH 6-9
Flow: w/scrubber wo/scrubber
Strip/sheet & misc. prod. 835 l/kkg (200 gal/ton) 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 3130 l/kkg (750 gal/ton) 3500 l/kkg (600 gal/ton)
OIL
Cascade rinse system to minimize flow. 625 l/kkg(150 gal/ton) for strip/sheet & misc. products. 2500 l/kkg(600 gal/ton) for wire products & fasteners.
CHROME REDUCTION TANK
(Galvanizing Only)
REACTOR
FLOCCULATOR
CLARIFIER w/OIL SKIMMER
RECYCLE PUMP STATION
(Fume hood scrubber systems only)
Solids to Disposal
VACUUM FILTER
Air (Terne and other metals only)
Susp. solids
Oil & grease
Zinc
Chromium
Cadmium
Copper
Lead
Nickel
Refer to Figures X-1, X-4 and X-7 for water quality.
pH 5-9
Flow: w/scrubber wo/scrubber
Strip/sheet & misc. prod. 3130 l/kkg (750 gal/ton) 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 8760 l/kkg (2100 gal/ton) 2500 l/kkg (600 gal/ton)
Alkaline Wastes
EQUALIZATION TANK
OPTIONAL COMPONENT
NSPS MODEL
Dwn. 10/10/79

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/ALL TYPES
SUBCATEGORY
NSPS MODEL-ALTERNATIVE I

FIGURE XII-1


Recycle to wet fume hood scrubber
2295 l/kkg(550 gal/ton) for strip, sheet & misc. prod.
5630 l/kkg(1350 gal/ton)for wire prod. & fasteners.
Fresh water makeup
210 l/kkg(50 gal/ton) for strip, sheet & misc. prod.
625 l/kkg(150 gal/ton) for wire prod. & fasteners.
Na2S2O5 addition system is used only if required to supplement reducing capabilities of the available acid wastes.
Acid Wastes
EQUALIZATION TANK
Na2S2O5 SOLUTION
POLYMER
LIME
IRON SULFIDE
OIL
PRESSURE FILTER
Cascade rinse system to minimize flow. 625 l/kkg(150 gal/ton) for strip/sheet & misc. products. 2500 l/kkg(600 gal/ton) for wire products & fasteners.
CHROME REDUCTION TANK
(Galvanizing only)
REACTOR
FLOCCULATOR
RECYCLE PUMP STATION
(Fume hood scrubber systems only)
Solids to Disposal
VACUUM FILTER
Air
(Terne & other metals only)
Susp. solids
Oil & grease
Zinc
Chromium
Cadmium
Copper
Lead
Nickel
Refer to Figures X-2, X-5 & X-8 for water quality.
pH 6-9
Flow: w/scrubber w/o/scrubber
Strip/sheet & misc. prod. 835 l/kkg (200 gal/ton) 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 3130 l/kkg (750 gal/ton) 2500 l/kkg (600 gal/ton)
Alkaline Wastes
EQUALIZATION TANK
Susp. solids
Oil & grease
Zinc
Chromium
Cadmium
Copper
Lead
Nickel
Refer to Figures X-2, X-5 & X-8 for water quality.
pH 5-9
Flow w/scrubber w/o/scrubber
Strip/sheet & misc. prod. 3130 l/kkg (750 gal/ton) 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 8760 l/kkg (2100 gal/ton) 2500 l/kkg (600 gal/ton)
OPTIONAL COMPONENT
NSPS MODEL
Dwn.11/2/79

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/ALL TYPES
SUBCATEGORY
NSPS MODEL-ALTERNATIVE 2

FIGURE XII-2

HOT COATING SUBCATEGORY

SECTION XIII

PRETREATMENT STANDARDS FOR HOT COATING PLANTS DISCHARGING TO PUBLICLY OWNED TREATMENT WORKS

Introduction

This section discusses the alternative control and treatment systems available for hot coating operations which discharge waste solutions to publicly owned treatment works (POTW). Consideration has been given to the pretreatment of hot coating process wastewaters from new sources (PSNS) and from existing sources (PSES).

The main factor considered in the development of a pretreatment system is the need to insure that the hot coating wastewaters are treated or limited sufficiently to avoid overloading the POTW treatment system and to avoid the introduction of pollutants to the POTWs which would interfere with, pass through, or otherwise be incompatible with its operations.

General Pretreatment Standards

For detailed information on Pretreatment Standards, refer to 43 FR 27736-27773, "General Pretreatment Regulations for Existing and New Sources of Pollution," (June 26, 1978). In particular, 40 CFR Part 403 describes national standards (prohibited discharges and categorical standards), revision of categorical standards through removal allowances, and POTW pretreatment programs.

The General Pretreatment Regulations set forth general discharge prohibitions that apply to all non-domestic users of a POTW to prevent pass-through of pollutants, interference with the operation of the POTW, and municipal sludge contamination. The regulations also establish administrative mechanisms to ensure application and enforcement of prohibited discharge limits and categorical pretreatment standards. In addition, the Regulations contain provisions relating directly to the determination of and reporting on Pretreatment Standards.

Categorical Pretreatment Standards

In establishing pretreatment standards for hot coating operations, the Agency gave primary consideration to the objectives and requirements of the General Pretreatment Regulations.

Due to the presence of toxic pollutants in wastewaters from hot coating operations, extensive pretreatment must be provided to ensure that these pollutants do not interfere with or, pass through, or are otherwise not compatible with POTW operations or cause harm to the treatment plant. In general, the pretreatment wastewater treatment technologies are the same as the BAT level treatments. Pretreatment standards for suspended solids and oil and grease are not proposed because these pollutants, in the amounts present in this subcategory, are compatible with POTW operations and can be effectively treated at POTWs.

PSES alternative treatment systems are the same as the BAT alternative treatment systems. The PSES standards associated with each alternative treatment system for all hot coating operations are set out in Tables XIII-1 through XIII-3. The alternative systems are based on the BAT alternative treatment systems, and are shown in Figures XIII-1 and XIII-2. Cost estimates were shown in Tables VIII-17 through VIII-19.

A. PSES Alternative 1

This alternative begins with flow minimization by cascade rinsing and fume scrubber recycle, followed by chemical reduction of chromium (if present as hexavalent chromium) or aeration (for terne and other metal coatings), lime precipitation, flocculation with polymers, and clarification with vacuum filtration of underflows. Justification of this technology and its effectiveness in controlling toxic metals is provided in Sections IX and X.

B. PSES Alternative 2

Alternative 2 is based on Alternative 1, with the addition of sulfide precipitation to enhance removal of dissolved toxic metals. The lower solubility of sulfides when contrasted with hydroxides provides more complete conversion of dissolved toxic metals into solid precipitates. These in turn are removed by filtration just prior to discharge to the POTW.

New Sources

The alternative pretreatment systems for new sources are identical to the pretreatment systems for existing sources discussed above.

Rationale for the Selection of Pretreatment Technologies

The pretreatment systems identified above are means of reducing toxic metal pollutant levels and loads. Pretreatment standards must be provided for toxic metals as toxic metals can inhibit the POTW treatment process, pass through the POTW, contaminate the POTW sludges, or otherwise interfere with the operation of the POTW.

Certain toxic metals inhibit the biological treatment process. The use of the alternative pretreatment systems will minimize the discharge of toxic metals from hot coating operations. The possibility exists that a POTW could discharge undesirable levels of toxic metals when accepting industrial process wastewaters. Inasmuch as domestic wastewaters typically do not contain objectionable concentrations or quantities of toxic metals, it is incumbent upon industrial process wastewater contributors to a POTW to control the levels and loads of toxic metals discharged to POTWs.

The toxic metals, which do not pass through a POTW, concentrate in the POTW sludges. Generally, land application is the most advantageous, yet least expensive method of POTW sludge disposal as the sludge can be used to replace soil nutrients. However, excessive amounts of toxic metals in sludges could inhibit plant growth thus rendering the sludge unfit for use as a soil nutrient supplement. In addition, these metals could enter either the plant and/or animal food chains or could leach into the groundwater. For the above reasons, the control of toxic metals discharges to a POTW is essential.

Selection of Pretreatment Standards

The Agency selected Alternative 1 as the PSES model treatment system. The proposed PSES are based on that treatment system. It provides for the minimization of the discharge of toxic metals which may otherwise adversely affect the performance of POTWs.

The Agency is not proposing standards for suspended solids or oil and grease, because these pollutants, in the amounts present in hot coating wastewaters, are compatible with POTW operations and can be effectively treated at POTWs. However, it should be noted that the control of suspended solids is an important factor in control of toxic metals.

TABLE XIII-1

PSES EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - GALVANIZING

PSES Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium	Lead	Zinc	Flow Basis GPT
A. Alternative 1*				
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150
Add to A1 for scrubbers	0.000021	0.000021	0.000021	50
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	600
Add to A2 for scrubbers	0.000063	0.000063	0.000063	150
B. Alternative 2				
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150
Add to B1 for scrubbers	0.000021	0.000021	0.000021	50
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	600
Add to B2 for scrubbers	0.000063	0.000063	0.000063	150

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(1) 30-day average limitations. Daily maximum values are three times the limitations stated.

*: Selected PSES alternative.

TABLE XIII-2

PSES EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - TERNE METAL

PSES Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium	Lead	Zinc	Flow Basis GPT
A. Alternative 1*				
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150
Add to A1 for scrubbers	0.000021	0.000021	0.000021	50
B. Alternative 2				
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	150
Add to B1 for scrubbers	0.000021	0.000021	0.000021	50

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(1) 30-day average limitations. Daily maximum values are three times the limitations stated.

*: Selected PSES alternative.

TABLE XIII-3

PSES EFFLUENT LIMITATIONS GUIDELINES
HOT COATING - OTHER METAL COATINGS

PSES Effluent Limitations in kg/kkg (lbs/1000 lbs)(1)

	Chromium	Lead	Zinc	Cadmium(2)	Basis GPT
A. Alternative 1*					
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	0.000063	150
Add to A1 for scrubbers	0.000021	0.000021	0.000021	0.000021	50
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	0.000250	600
Add to A2 for scrubbers	0.000063	0.000063	0.000063	0.000063	150
B. Alternative 2					
1. Strip, Sheet, Misc. Prod. Basic	0.000063	0.000063	0.000063	0.000063	150
Add to B1 for scrubbers	0.000021	0.000021	0.000021	0.000021	50
2. Wire Products & Fast. Basic	0.000250	0.000250	0.000250	0.000250	600
Add to B2 for sscrubbers	0.000063	0.000063	0.000063	0.000063	150

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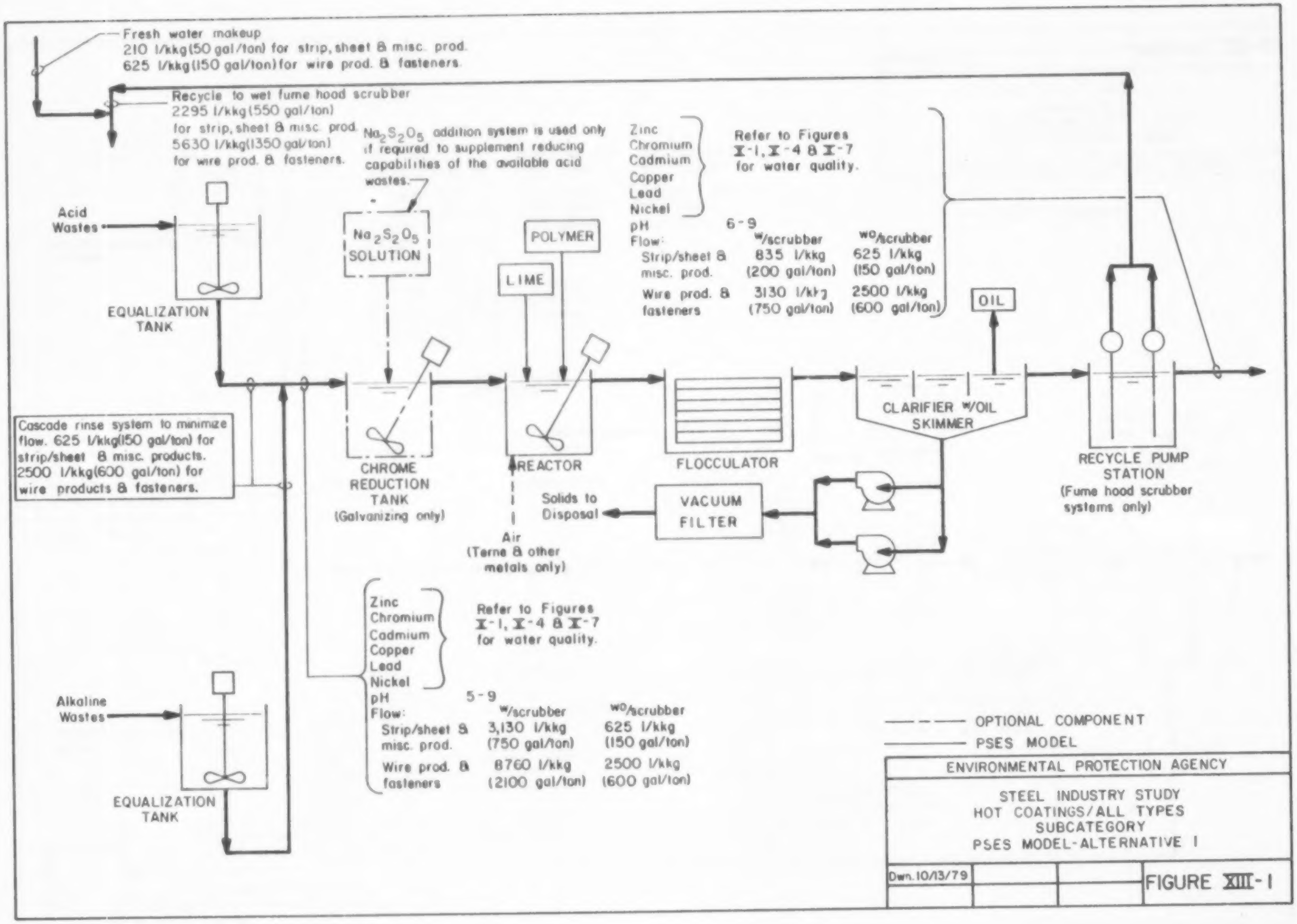
(1) 30-day average limitations. Daily maximum values are three times the limitations stated.
(2) Limits on cadmium apply only to operations which use cadmium as a coating metal.

*: Selected PSES alternative.

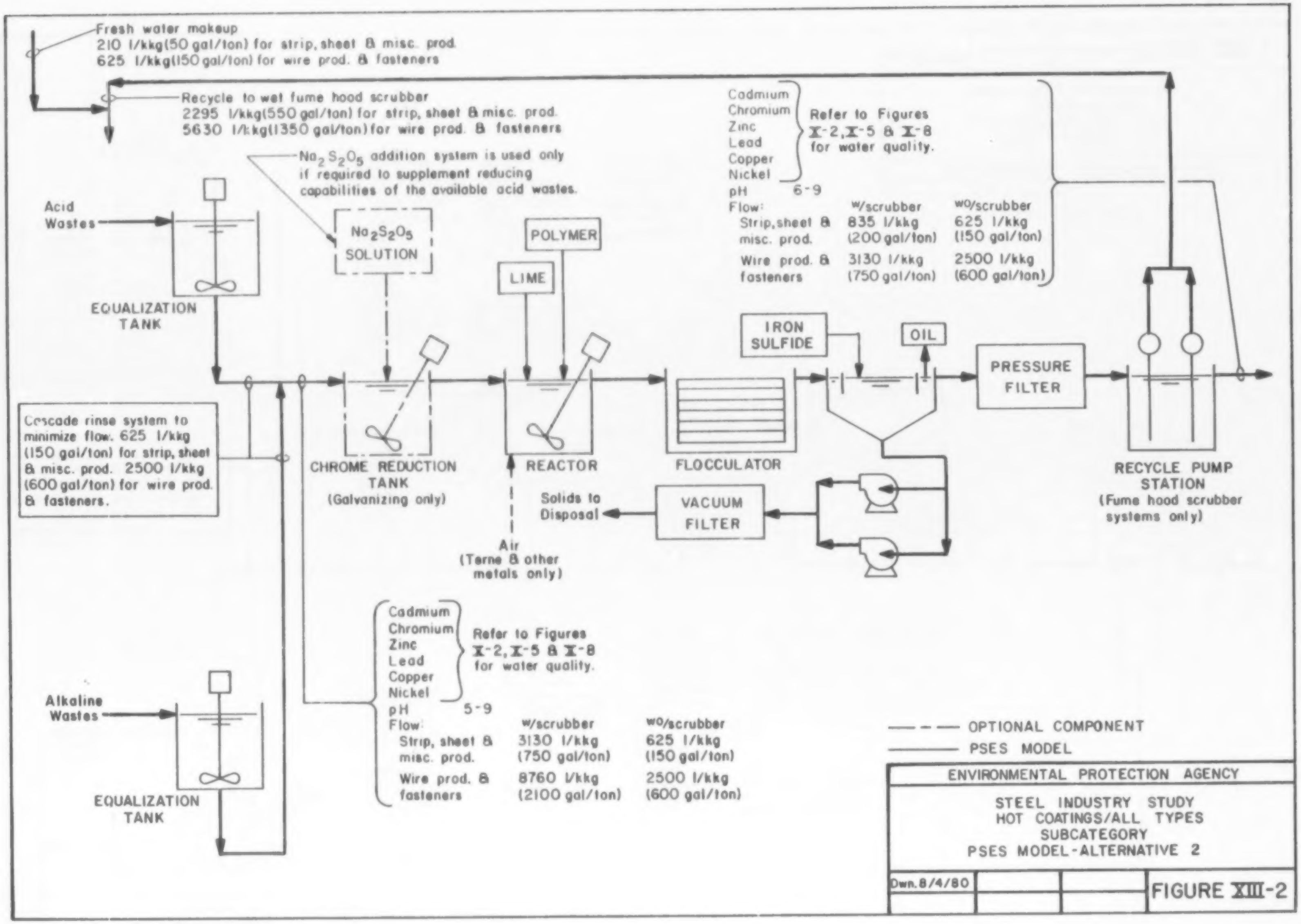


Fresh water makeup
210 l/kkg(50 gal/ton) for strip, sheet & misc. prod.
625 l/kkg(150 gal/ton) for wire prod. & fasteners.
Recycle to wet fume hood scrubber
2295 l/kkg(550 gal/ton)
for strip, sheet & misc. prod.
5630 l/kkg(1350 gal/ton)
for wire prod. & fasteners.
Acid Wastes
EQUALIZATION TANK
Cascade rinse system to minimize flow. 625 l/kkg(150 gal/ton) for strip/sheet & misc. products. 2500 l/kkg(600 gal/ton) for wire products & fasteners.
$Na_2S_2O_5$ addition system is used only if required to supplement reducing capabilities of the available acid wastes.
$Na_2S_2O_5$ SOLUTION
CHROME REDUCTION TANK
(Galvanizing only)
LIME
POLYMER
REACTOR
Air
(Terne & other metals only)
Zinc
Chromium
Cadmium
Copper
Lead
Nickel
Refer to Figures X-1, X-4 & X-7 for water quality.
pH 6-9
Flow: w/scrubber wo/scrubber
Strip/sheet & misc. prod. 835 l/kkg (200 gal/ton) 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 3130 l/kkg (750 gal/ton) 2500 l/kkg (600 gal/ton)
FLOCCULATOR
CLARIFIER W/OIL SKIMMER
OIL
VACUUM FILTER
Solids to Disposal
RECYCLE PUMP STATION
(Fume hood scrubber systems only)
Alkaline Wastes
EQUALIZATION TANK
Zinc
Chromium
Cadmium
Copper
Lead
Nickel
Refer to Figures X-1, X-4 & X-7 for water quality.
pH 5-9
Flow: w/scrubber wo/scrubber
Strip/sheet & misc. prod. 3,130 l/kkg (750 gal/ton) 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 8760 l/kkg (2100 gal/ton) 2500 l/kkg (600 gal/ton)
OPTIONAL COMPONENT
PSES MODEL
Dwn. 10/13/79

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/ALL TYPES
SUBCATEGORY
PSES MODEL-ALTERNATIVE I

FIGURE XIII-1


Fresh water makeup
210 l/kkg(50 gal/ton) for strip, sheet & misc. prod.
625 l/kkg(150 gal/ton) for wire prod. & fasteners
Recycle to wet fume hood scrubber
2295 l/kkg(550 gal/ton) for strip, sheet & misc. prod.
5630 l/kkg(1350 gal/ton) for wire prod. & fasteners
Na2S2O5 addition system is used only if required to supplement reducing capabilities of the available acid wastes.
Acid Wastes
EQUALIZATION TANK
Na2S2O5 SOLUTION
LIME
POLYMER
Cascade rinse system to minimize flow. 625 l/kkg (150 gal/ton) for strip, sheet & misc. prod. 2500 l/kkg (600 gal/ton) for wire prod. & fasteners.
CHROME REDUCTION TANK (Galvanizing only)
REACTOR
Air (Terne & other metals only)
FLOCCULATOR
IRON SULFIDE
OIL
PRESSURE FILTER
RECYCLE PUMP STATION (Fume hood scrubber systems only)
VACUUM FILTER
Solids to Disposal
Cadmium, Chromium, Zinc, Lead, Copper, Nickel: Refer to Figures X-2, X-5 & X-8 for water quality.
pH 6-9
Flow: w/scrubber / wo/scrubber
Strip, sheet & misc. prod. 835 l/kkg (200 gal/ton) / 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 3130 l/kkg (750 gal/ton) / 2500 l/kkg (600 gal/ton)
Alkaline Wastes
EQUALIZATION TANK
Cadmium, Chromium, Zinc, Lead, Copper, Nickel: Refer to Figures X-2, X-5 & X-8 for water quality.
pH 5-9
Flow: w/scrubber / wo/scrubber
Strip, sheet & misc. prod. 3130 l/kkg (750 gal/ton) / 625 l/kkg (150 gal/ton)
Wire prod. & fasteners 8760 l/kkg (2100 gal/ton) / 2500 l/kkg (600 gal/ton)
— — — OPTIONAL COMPONENT
——— PSES MODEL
Dwn. 8/4/80

ENVIRONMENTAL PROTECTION AGENCY

STEEL INDUSTRY STUDY
HOT COATINGS/ALL TYPES
SUBCATEGORY
PSES MODEL-ALTERNATIVE 2

FIGURE XIII-2

*U.S. GOVERNMENT PRINTING OFFICE: 1981-0-341-085/4625